

The Chemical Age

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Notes and Comments

Art and Science

ALL who were privileged to hear the address given on April 3 to the London Section of the Society of Chemical Industry by Professor A. P. Laurie will carry away the recollection of a definitely romantic piece of scientific work still in progress and not likely to be completed for many a year to come. The art of the painter is far older than the civilisation of man. Rock drawings and crude attempts at painting are found among the deposits of the stone age and the bronze age long before the dawn of written history. More than five thousand years ago man was consciously searching for better, brighter and more durable pigments wherewith to colour his pictures. Nearly the oldest piece of scientific research was described by Professor Laurie and was directed to this end—a research which would be no disgrace to any scientific worker to-day. To obtain one colour, certain minerals had to be mixed in definite proportions and heated in a furnace for 48 hours at a high temperature. Fifty degrees was the maximum permissible temperature range during the whole of this time. A few degrees too high, and the pigment produced was green; a few degrees too low, and the reaction was insufficient; the correct conditions yielded a marvellous blue. By what methods were these facts discovered more than 5,000 years ago? How was that precise control obtained over the temperature in those days before the dawn of science? There is something indescribably fascinating in the inquiry concerning the manners, customs and habits of thought of our more remote ancestors.

Professor Laurie reminds us that the first artists were chemists. The artists had to discover and usually to manufacture their own colours, and the early books on painting, written by artists for artists, contain many recipes for doing this. It is the duty of science, for the advancement of the art of painting, to discover the wherefore of the early recipes. In this, science has been set an intensely difficult task, frequently only achieved through some chance observation.

A Rich Promise of Discovery

IF we do not misunderstand Professor Laurie, the artists' materials and pigments to-day are much inferior in durability and brilliancy to those used in the middle ages. No doubt the old artists learned their lessons through long generations of trial and failure, but it should not be beyond the power of science to devise some means whereby the behaviour of colouring materials can be tested in a few months at the most. It would appear that in the discovery and testing of artists' materials lies a fruitful field for the chemist and physicist. The mechanics of chemical reactions and

physical change in interfacial regions is a young, but interesting branch of physical chemistry. Investigation upon these lines should yield important results; moreover, the work holds out a rich promise of discovery in the field of pure science, and should, therefore, appeal to many among our university staffs. Nevertheless, it is desirable that those who take up this work should have a real sympathy with the work of the artist, and should not hold the view, expressed by one speaker at the meeting, that what is wanted is not a method of rendering paintings more permanent, but of ensuring that the majority would disappear completely within a limited time. There may be some justification for this pessimistic view, but the research worker in this field should rather be imbued, as is Professor Laurie, with an intense desire to assist the practitioners in another great branch of human activity.

There is much in common between the chemist and the artist, and it is not without significance that some of the more eminent among scientific men are also practitioners or patrons of art. Craftsmanship, as Professor Laurie reminded us, is dying; although the artist no longer is a craftsman in the sense that he prepares his own materials, it cannot be held that the artist has ceased to be a creative craftsman. The chemist and the physicist are also in a very real sense, craftsmen. The experimental scientist must always be a craftsman and if ever he ceases to belong to that august guild scientific investigation will cease. Much of the best experimental work has been done with apparatus made by the experimentalist and with chemicals prepared by him from the crude raw materials. Moreover, the true scientific worker must possess the imagination and vision of the romanticist, of the artist and of the poet.

Unemployment and Public Expenditure

WE commend to the attention of our readers the article on "This Spending Push," by Sir Ernest Benn in THE CHEMICAL AGE of April 1. The problem of unemployment is one of extreme difficulty, particularly if it be regarded on sentimental lines. It is appalling that this country should have nearly three million unemployed, and most people will agree that those in work should contribute to provide the bare necessities of life for those out of work. Not so long ago the speaker's butler, writing to the "Times" recalled past depressions of fifty years ago when unemployment was relatively as bad as it is to-day and there was no dole. In those days, he said, the unemployed were maintained by their friends and the crisis was got over without much real suffering. It is better that the burden of keeping those for whom we cannot find work should be

distributed with some uniformity throughout the population than that it should fall hardly upon some individuals and leave others untouched.

No doubt it is for that reason that so many are again flirting with the idea of spending on public works. No expenditure should be incurred in work of that character unless the work passes the criterion of being economically sound. What chemical manufacturer, on being urged to "spend for employment," will raid his reserves to build a large new sulphate of ammonia factory, when he knows quite well that the ammonia field is already amply covered. He may, in the legitimate course of his business, start some new venture and build a new plant, but it will be for a purpose which can be expected to show him a solid financial return for his money. Exactly the same considerations should apply to the spending of public money.

Get Trade on the Move

It may be possible to produce some definite proposals for public works which will be above all criticism, but it seems improbable. The best method of assisting to reduce unemployment is to get trade on the move again. We made some remarks recently on the world anomaly of poverty in the midst of plenty. The Government might usefully give attention to that much greater problem. The smaller problem at home would disappear if the larger world problem were solved. But the domestic unemployment problem will never be solved by public works; when those public works are finished what then?—more public works? and so *ad infinitum*? We cannot afford it. Having put our affairs in order the Government appears to be in danger of emulating the man who pulls up his newly planted seedlings to see how they are growing. In the best gardening circles this is simply not done.

What is needed is that every possible encouragement should be given to industry. If a little public money is to be adventured, let it be adventured in support of industry. Industrialists are united in their insistence that they could show a definite upward trend of trade, and therefore a reduction of unemployment if the Government would ease their burdens. Last week we commented on suggestions to that effect made by Sir Harry McGowan and Mr. Gledhill. Mr. Mitchell, chairman of the National Committee for the Iron and Steel Industry, believes that the iron and steel industry would similarly respond to a reduction in taxation. The Chancellor of the Exchequer ought, in his opinion, to take his courage into his hands and say: "Now that we in this country and the Empire have shown the world how we can stand together, now that we have consolidated ourselves to a very considerable degree, now is the time to take a speculative risk and ease that burden of taxation which is handicapping trade." Much depends, no doubt, upon the manner in which industry conducts its affairs. Certainly the industrialists' plan is sounder than the suggested outpouring of money on public works. The Government might do worse than trust the industrialists to redeem their promise. The politicians have had a long innings: we should like to see the next batsman have a chance. There is ample money in this country to finance vast new enterprises. There are the brains to think out new ventures that have every chance of success. Money rates are so cheap that under normal

conditions investors would be expected to seek for outlets in the industrial field. Confidence alone is lacking. Industrialists claim that by easing their burdens and those of investors confidence would be re-established and the wheels of industry would be lubricated. In any steps that are taken in this direction, in any restoration of confidence among investors, the chemical industry should not be neglected.

The Lay-out of Industrial Districts

THE Easter holidays, compelling through the attraction of ultra-violet radiation a general trek of town dwellers to the country, lends point to certain aspects of the correspondence which has followed the explosion at the chemical works at Mitcham. It has been suggested that houses should never be near a chemical or other works where there is the least likelihood of danger. Chemical works, in particular, it is contended, should be far from the neighbourhood of populated dwellings. There is, at the outset, one difficulty, namely, that of deciding what works are dangerous and what are not. If the record of past explosions be taken as a guide, no dwellings must ever be erected near a works which uses a steam boiler, and in view of the very much higher pressures used to-day boilers must be regarded as specially dangerous. Gasholders would not be considered so dangerous as most types of plant of similar nature were it not that the Neunkirchen explosion has shown what unexpected things may happen given a conjunction of unforeseen circumstances. There is more definite reason for removing houses from the vicinity of certain works because of the fumes, smoke or deleterious gases evolved. With the best supervision from alkali inspectors—why not "acid inspectors"?—and from smoke nuisance inspectors, it cannot be contended that the neighbourhood of many industrial works is a satisfactory substitute for a health resort.

The Present Conditions Explained

What generally happens, of course, is that a manufacturer builds his works out in the country where rates are low and other factors are suitable. He does not purchase the land round the works, that would often entail too great an expenditure, so the local builders speculate and erect a number of houses, starting as close to the walls of the works as possible in the expectation that the nearer the houses are to the works, the more easily will they let or sell. Since the land has been purchased speculatively, the builder's return will be the greater the more houses he can put upon a given site. Thus is a slum born. The convenience of modern transport has removed any truth that there might once have been in the plea that the workers must live near their work. Every worker is now entitled to country surroundings and to fresh air free alike from a man-made smoke-cloud screening the ultra-violet rays and from deleterious gases in the atmosphere. The improvement in health which should follow the general adoption of this practice—seen at its best at such places as the Bournville garden city—cannot be a matter of indifference to the nation. We cannot afford a drastic redistribution of houses and works. This generation must "grin and bear it" but at least we can insist that our local authorities shall see that town planning is the rule for the future in every industrial district.

Commercial Applications of Ozone

A Bleaching and Sterilising Agent with a Great Future

OZONE has received considerable attention among chemical workers since the early experiments of Van Marum and Schönbein and the proof by Andrews that the gas from all sources was identical in constitution. Chemical and other industries with a chemical bias have been slow to realise the value of this active form of oxygen, more particularly in this country where the use of chlorine for bleaching and sterilising has become too firmly established for considering any alternative agent.

The blame for the slow recognition or adoption of ozone cannot be laid on any difficulty or expense as regards manufacture, for the plants of the ozonair type made in this country, and of the Otto and the Siemens-Halske types in Germany, leave nothing to be desired as regards efficiency. In principle all modern ozonisers are modifications of the Siemens apparatus used in schools and colleges, in which two concentric glass tubes are lined with tinfoil as electrodes, air or oxygen being passed between the two so that it comes into contact only with the glass. The majority of commercial designs have actually adopted glass as dielectric, although mica and vitreosil are efficient alternatives. The essentials for an ideal ozone plant are, firstly, the avoidance of heat production by the silent electrical discharge, since ozone begins to decompose appreciably round about 100° C.; secondly, the avoidance of any sparking or brush discharge as this leads to the formation of oxides of nitrogen; and thirdly, the apparatus must be simple and economical to operate from the existing A.C. mains supply. It has become the rule to use potentials of between 7,000 and 10,000 volts, a single phase high frequency current being necessary.

Recent Developments

Batteries of smaller units are assembled in cases where large installations are required, a good example of this being the Siemens-Halske plants, in which six or eight glass cylinders are fixed vertically or horizontally in an iron tank which is water-cooled and earthed. In each cylinder is an aluminium cylinder serving as electrode, air passing through the gap between glass and aluminium. A recent type of Siemens-Halske includes glass beads or other granular non-conductor packed between the electrodes for avoiding brush discharges (Brit. Pat. 276,637 and 277,651). Each set takes half a kilowatt and yields 50 gm. ozone per kWh at an average concentration of 2.5 gm. per cubic metre of air. The Otto type was first built with no dielectric, a number of aluminium discs constituting one electrode and revolving in such a way as to draw out and break any sparks formed between them and the iron casing electrode. The system has now been changed to a glass dielectric type. In the Gerard plant the nearest approximation to the laboratory pattern is attained, since there are pairs of concentric glass cylinders with metal layers as electrodes fixed to the outer surface of outer glass cylinder and to inner surface of the second glass cylinder. Each set is mounted in an outer zinc cylinder to act as condenser for promoting ozone formation, while the whole is erected in an oil-cooled bath.

The Ozonair System

The only type of ozoniser which works efficiently without cooling devices appears to be the ozonair system. It is the open construction of the electrodes (which are sheets of aluminium alloy gauze) which permits the omission of water-cooling; while a second advantage of gauze as electrodes is that discharge is effected over an infinite number of points, and the consequent reduction in the discharge density factor eliminates sparking. As dielectric thin layers of mica are incorporated so that the plant can be worked if necessary on low voltages and periodicity, such as 9,000 volts for the highest concentrations of ozone, and 25 cycles. Several pairs of sheets are mounted to form one unit, while nearly 50 different types are marketed for meeting every conceivable requirement. The yields claimed are high, varying from 300 gm. per kilowatt, in cases where low concentration is sufficient (as in air conditioning), to 100 gm. per kilowatt as concentrations high enough for bleaching purposes. For special cases, such as in the research laboratory, there is a small ozone

generator enclosed in a metal tank cooled by water or by a freezing mixture; the electrodes are of the ozonair type, but it is capable of producing 16 gm. of ozone per cubic metre of air, this figure being the highest obtainable in practice.

Among chemical applications in which the action of ozone is fully understood are the preparations of vanillin from isoeugenol and of artificial camphor; while other possibilities not yet adopted are the conversion of isosafrol to heliotropine, of amethol to an artificial hawthorn perfume, and the oxidation of impurities in tar oils. The oxidation of linseed oil in making transparent varnishes and the preparation of ozonides of caoutchouc are other examples in which the mode of action is quite definitely fixed.

Use as Bleaching Agent

Ozone is undoubtedly a bleaching agent with a future; both deodorisation and bleaching are effected in treating soya bean oil, edible oils and fats, and certain waxes. The higher cost has been the chief factor in limiting its use, although it is claimed that beeswax can be bleached more economically by the ozone method when compared with the air bleaching or bichromate methods. In the bleaching of paper pulp ozone is considered to be more desirable and economical compared with chlorine compounds. The gas has been adopted by a Milan concern in place of hypochlorite for the bleaching of cotton goods; and a similar use is described in the French Pat. 622,646, in which it is claimed that after treating raw textile fibres for seven hours with 6 per cent. caustic soda, and washing and slightly acidifying the material, the fibres may be bleached while moist in a chamber through which passes air containing 4.5 to 9.0 gm. ozone per cubic metre.

The use of ozone as an agent for treating municipal water supplies has been chiefly confined to Europe and America. Otto and Siemens-Halske systems are prominent on the Continent, while America uses Howard-Bridge and Vosmaer systems designed in that country. The General Electric Co. have also an ozonising system on the market. The slight solubility of ozone demands an efficient intimate contact; so that either a counter-current tower system with packings of stones or gravel is used, or a tower with perforated plates as in the Siemens—de Vrise and Gérard tower systems. An alternative is the Otto system in which ozonised air is bubbled rapidly through moving columns of water, being forced in by an injector device. For treating the atmosphere in slaughter-houses, hide and skin warehouses, bone and offal works, and in all other "offensive trades," ozone has no equal. It is the recognition of this fact that has led to the adoption of dilute ozonised air in the conditioning of air admitted to public buildings, cinemas, etc. A typical and widely used method consists of, firstly an air filter of the viscous film type, this being an essential since the concentration of ozone is greatly diminished by the presence of organic dust; secondly, a warming and humidifying section; and thirdly, a mixing chamber where this purified air is admixed with ozonised air.

Beneficial Effect in Malting

In the brewing industry a low concentration of ozone in air has proved beneficial in malting, in controlling the yeast by freeing the liquor from wild organisms, and in giving a mellowing effect to liquor in a much shorter time than by storage. This action has been explained by assuming a decreased aldehyde content and an increased ester content. In the food industries ozone is proving an important sterilising agent, but concentration must be kept very low, for whereas an overdose in sterilised water is impossible owing to the low solubility, there is a different result in treating butter and milk with more than a small dosage. The maturing of timber is yet a further example of ageing effects; in case of timber it is surprising to find that few concerns have realised this method of seasoning in 20 days by treatment with ozonised air in place of a few years storage. In the textile industries there is a second application other than in bleaching, *viz.*, in the treatment of wool prior to dyeing so as to enable a lower temperature of dye bath to be used, and in ozonising fabrics to prevent shrinkage during subsequent dyeing or washing.

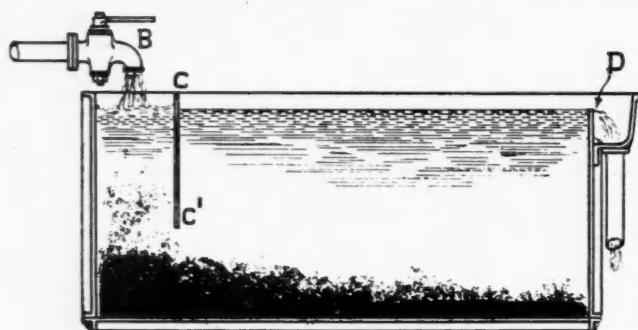
Centrifugal Separation and Decantation

Wider Uses for the Centrifugal in the Chemical Industry

We give below a further article of interest to present and potential users of centrifugal machines. In this case we are indebted to Watson, Laidlaw and Co., Ltd., for providing the information and illustrations.

THE mechanical problems in the design and construction of centrifugal machines for the chemical industry are fundamentally the same as for centrifugal machines and hydro-extractors for use in other industries, but special considerations in connection with the treatment of chemicals have an important bearing on both design and construction, and some of these considerations call for very special machines. Makers of centrifugal machines who specialise in this branch of engineering are well acquainted with the mechanical difficulties involved and have overcome these difficulties so successfully that the mechanical perfection of these high-speed machines is now of a high order. Where special construction is necessary to meet certain conditions, centrifugal engineers can generally advise so far as the mechanical problems are concerned, but not infrequently the difficulties in successfully obtaining certain results are more the concern of the chemical manufacturer than of the engineer.

The fact that a heavy load must be brought from rest to a high speed, with the possibility that the load may not be perfectly balanced, and that this operation must be performed several times an hour for many hours without cessation, does not need further comment on the need for expert engineering knowledge in the design of the machines.



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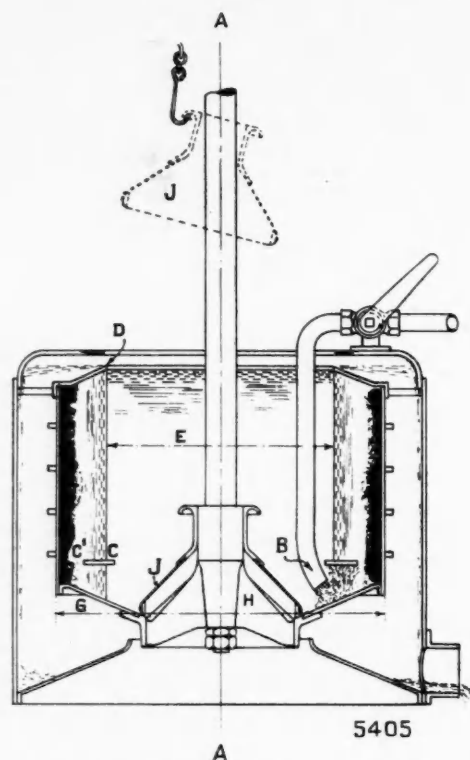
Fig. 1.—Ordinary Settling Tank for Decantation by Gravity.

Apart from purely mechanical considerations of design, the chemical industry in particular frequently requires a construction to resist the corrosive nature of many of the substances treated. In order to overcome the problems of corrosion, many different acid-resisting metals and substances have been used, either for the actual manufacture of the machine or its parts, or to protect the metals of which the machine is made. This, of course, refers particularly to the basket and its discharge valve, the spindle and the outer casing. It is obvious that the centrifugal machine may be dangerous if it is not properly designed and made, and, when the risk of acute corrosion is added, the danger of serious accident is greatly increased. Every centrifugal machine should be regularly inspected by an expert, and this is particularly necessary in the chemical industry.

Not only is the centrifugal machine used in the chemical industry for removing surplus moisture or liquid from crystalline and granular materials, in which process either the solid or the liquid may be the valuable product to be recovered, but for many other processes such as the separation of finely divided solids from liquids, or the separation of liquids of different specific gravities. For such problems as decantation, it is necessary to have the revolving basket made without perforations in the shell plate, and in this case the machine must have other special features, because the behaviour of the machine is very different when operating on such work as compared with the operation on the more usual problems of drying crystalline or granular materials. In many cases experiment is necessary in order to determine

how the machine may be used to the best advantage. The speed of the basket, the rate of feed, the thickness of the wall of solid in the basket, the nature of the loose linings in the basket, the length of time for treatment of a charge are all factors affecting the result, in addition to which the nature of the material being treated must be taken into account.

Chemical manufacturers who have not so far investigated the possibilities of centrifugal separation and decantation, or who regard the centrifugal machine as capable of performing only a limited operation in their works, would do well to review their processes and see whether it is possible to use



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Fig. 2.—Suspended Centrifugal Machine with Imperforate Basket for Centrifugal Decantation.

centrifugal machines more extensively, because these machines offer the quickest and most economical method of performing many operations which are otherwise costly, slow and laborious. Apart from those engaged in centrifugal machine construction, there are probably few who realise the varied uses to which centrifugal machines are put. The well-known makers of centrifugal machines are always glad to place their experience at the disposal of those interested and to make experiments where such are necessary.

Fig. 1 shows an ordinary settling tank for decantation by gravity, while Fig. 2 shows the basket and monitor case of a suspended centrifugal machine, in section, illustrating the imperforate basket and the mode of separation. It will be seen that the close similarity between the two methods is very striking, but the advantage in the case of the centrifugal machine is that the separating force exerted is many hundred times that of gravity, so that the separating effect is not only much more rapid but more complete. Fig. 3 shows a battery of twelve electrically-driven centrifugal machines arranged for decantation, and for discharging the contents of the basket through the floor into a lower room.

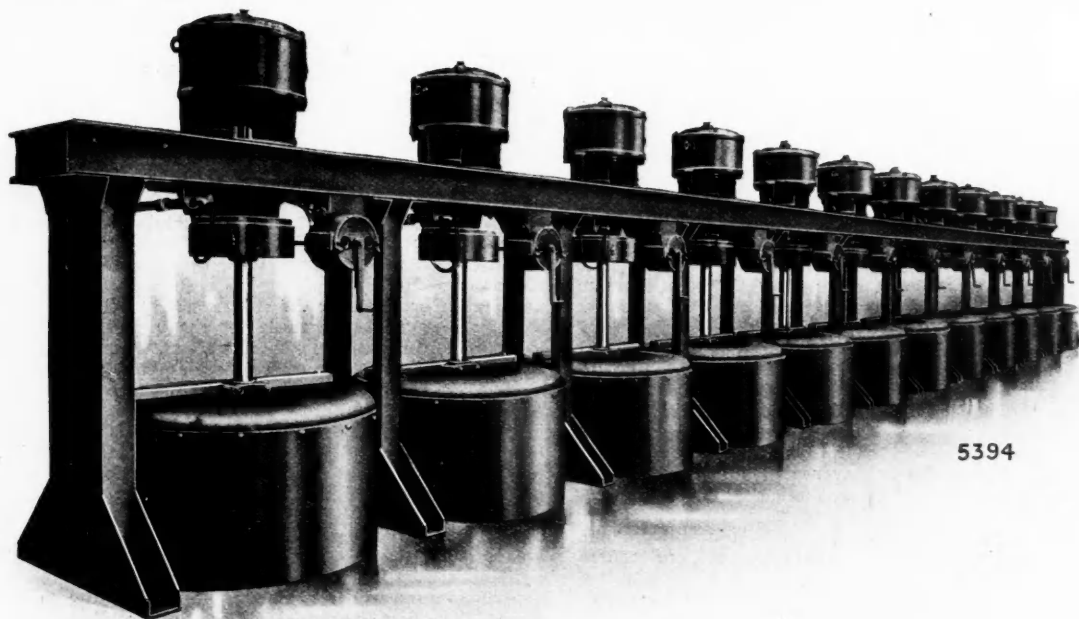


Fig. 3.—A Battery of Twelve Electrically-driven Centrifugal Machines arranged for Decantation.

Recent Developments in Textile Printing

Avoiding Corrosion on Copper Printing Rollers

Two useful printing processes emanating from the Continent and which, after examination, have been favourably reported upon are disclosed in the "Bulletin Soc. Ind. Mulhouse," 1933, 98, 555-561. The first process is described by Cheshire and relates to an effective method of avoiding corrosion of copper printing rollers as used in printing with sulphur dyes. All printers are aware that the sodium sulphide used in the printing paste readily attacks copper by formation of copper sulphide and that this attack quickly leads to obliteration of the engraved design. A number of methods have hitherto been suggested to overcome this difficulty but that now disclosed by Cheshire is simple and yet effective. Apparently a complex compound of sodium sulphide, sodium bisulphite, and formaldehyde does not attack copper in the cold, but on steaming this compound breaks up and behaves similarly to sodium sulphide in so far as it can reduce a sulphur dye and thereby promote its fixation in fabric. Cheshire's method, therefore, consists of using in the usual printing paste this complex compound instead of sodium sulphide. The special reducing agent is prepared by mixing 2 parts of 40 per cent. formaldehyde solution with 1 part of sodium bisulphite (67° Tw.), cooling this mixture to about 5° C., and then gradually adding in small portions 1 part of 65 per cent. sodium sulphide. The sodium sulphide dissolves, but after the solution has stood for 24 to 36 hours, the temperature being allowed to rise, it forms a paste suitable for use.

A printing paste which has been found quite satisfactory with various sulphur dyes including Thional Red Brown 5R, Thional Brilliant Green 2G, and Thional Yellow 5G, is prepared from sulphur dye 50 parts, glycerine 60 parts, caustic soda of 77° Tw. 30 to 40 parts, special reducing paste (as described above) 300 parts, British gum 40 per cent. 400 parts, and water 150 parts. Cotton fabric is printed with this paste in the usual manner, then dried, and steamed for five minutes in a Mather-Platt. It is then oxidised by passage through a bath containing 3 grams of hydrochloric acid and 3 grams of sodium bichromate per litre, being afterwards washed and soaped. Resist effects can be obtained using barium chloride or zinc chloride by the usual processes.

The second process mentioned is concerned with the printing of black and grey reserves under sulphur colours, it being possible in this manner to secure coloured fabrics of good fastness to washing. It is described by L. Goubyrin and depends on the fact that nitroso-dimethylaniline and resorcinol can combine to form black pigment. The process for black is effected by using a printing paste consisting of a solution of nitroso-dimethylaniline + resorcinol (described below as "Solution A") 400 grams, thickening (gum tragacanth) 400 grams, acetic acid 80 per cent. 20 grams, antimony salt solution (12 per cent. thickened with gum) 80 grams, and sodium chlorate 10 grams. Fabric is printed with this paste, then dried, and passed during five to six minutes through a Mather-Platt for development of the black printed effects, then overprinted with suitable sulphur dyes and finally washed, soured and soaped. "Solution A" consists of dimethylaniline 30 grams (converted into its nitroso derivative by diazotisation with 65 grams of HCl and 18 grams of sodium nitrite), oxalic acid 10 grams, sodium phosphate 30 grams, resorcinol 60 grams, and gum tragacanth thickening 50 grams.

Grey reserves are obtained by arranging for dilution of the black pigment with zinc white, and for this purpose the printing paste consists of "Solution A" 100 grams, gum tragacanth thickening 100 grams, antimony salt solution (12 per cent. thickened with gum) 80 grams, resorcinol solution (50 per cent. thickened with gum) 30 grams, and zinc chloride ("Solution B") 600 grams. "Solution B" is prepared from zinc chloride 500 grams, kaolin + gum (1/1) 200 grams, and starch 300 grams. It is also possible to use a mixture of alumina and zinc chloride in "Solution B."

THE chief synthetic aromatics produced in Roumania are amyl acetate, anethol, butyl butyrate, ethyl valerate, and ethyl anthranilate. It is estimated that the total production of these materials amounts to 120 tons a year. The local production does not cover the demand and considerable quantities of synthetic perfumes and flavours are imported in bulk by local manufacturers.

Chemical Engineering Overhead Charges Oncosts as Applied to Modern Chemical Works Practice

By S. HOWARD WITHEY, F.C.I.

THE majority of chemical engineering and production processes are now carried through at very narrow margins of profit, and consequently it is practically impossible to determine the directions along which economies can be effected unless the overhead charges have been systematically allocated to the different jobs and operations. In some instances it is possible to subject the machinery and plant to effective personal supervision, but in the majority of cases an organised costing system is an essential factor in executive control of chemical works practice, the system being expressed in periodical statistical reports by which efficiency can be measured and production costs reduced. For all practical purposes, the term "overhead charges" may be regarded as the total expense incurred apart from the cost of the materials used, the stores consumed, and the direct labour which is involved, and such charges are of two kinds, some being dependent on the turnover and others practically independent of the volume of production. Such charges as power, lighting, heating, the cost of small tools, wear and tear of machinery and plant, and the cost of repairs and maintenance of profit-earning equipment are, of course, variable charges, while on the other hand depreciation of chemical machinery—such as crushers, evaporators, grinders, mixers, etc.—caused by developments in science, invention, or research, and also such charges as rent and rates of the works premises; fire and other insurances; salaries of managers, departmental heads, inspectors and storekeepers, etc., are more or less fixed charges which are known in advance. Both the variable and the fixed charges, however, should be apportioned to the various departments, workshops, or chemical processes in accordance with a pre-determined plan which is designed to exhibit the real state of affairs with as few complications as possible.

Valuations and Depreciation

The addition of oncosts to prime costs in a manner calculated to ensure that each department of the works will actually carry its proper burden will not be a very difficult matter if the works premises are divided by reference to the nature of the operations conducted. Separate valuations can be made of the buildings, machinery, plant and fittings located in each department, and having once determined the separate totals and appointed the value on the basis of the area occupied by each department, workshop and store, the allocation of the overhead charges can be made in the form of percentages and rates. In the case of the tools department, for example, the repairs cost could be allocated on the basis of the capital value of the tools used in each department, spread between machine workers and hand workers on the estimate of the works manager, while repairs to the factory premises may be based on the area occupied by the individual shops less the area occupied by individual machines, except in the case of the machine shops where the machines should carry the entire burden.

To fix an hourly rate on the basis of the number of production hours worked, each machine and section of plant should have a record card on which will be shown such details as the present value; the depreciation per hour; interest on capital per hour; the average horse power per hour; the cost of power per hour; the upkeep cost per hour; and the machine hourly rate. The depreciation may be assessed by the straightline method, the estimated residual or scrap value being deducted from the cost of acquisition and installation, plus any attachments, the number of hours worked during the year being divided into the annual depreciation charge to give the depreciation per hour. If each machine is driven by separate motors, the horse power consumed can be readily ascertained by means of a meter, the average reading being multiplied by the motor voltage, giving the watts to be divided by 746, the result being the horse power consumed. In the case of the central drive, the capacity of the belting will give some idea of the horse power, reference being made to the tables showing the power transmitted by different belts at various speeds, although, of course, the most reliable method is to take dynamometer readings.

When factory process accounts are prepared each month, the fuel and power charges should be subdivided to show the cost of coal, slack, coke, coal gas, steam raising, water pumping, electrical power, compressed air, etc., the labour cost of handling coal being added to the total process fuel costs, and the power cost per unit of production calculated and supplied to the engineers. If the consumption of power by the process and repair shops has been ascertained, the cost under each heading for the month can be allocated accordingly, allowance being made for the use of power driven loose plant and tools by hand workers. Maintenance and upkeep of the power house and power plant, also repairs to electrical and mechanical transmission will be based on the power consumed, and depreciation of the power house building and plant can be calculated on the basis of an average life of fourteen years. The fixed factory expenses, including rent, rates, taxes, and repairs, also depreciation of the works premises on the basis of an average service life of twenty years in the case of brick buildings, and of ten years in the case of iron structures will be allocated by reference to the area occupied by the different departments, but heating and lighting is usually apportioned according to the value of the appliances used and the amount of current and heat consumed. The first or original values of all buildings and plant will form the basis for the spreading of fire insurances according to the risk of fire in the different departments.

Commercial overhead charges, as distinct from the factory oncosts, are generally applied as a percentage on the production cost, the charges being subdivided under suitable headings varying to some extent according to the size of the works and the particular processes undertaken.

Steam Boiler Maintenance

The Importance of Clean and Pure Water

It is common knowledge that for a steam boiler plant to work efficiently the water must be purified sufficiently to prevent the deposition of scale in the boiler, whilst corrosion due to acid or dissolved air in the water must also be eliminated. The use of absolutely clean, softened and slightly alkaline water is necessary if best results are to be obtained alike as regards long life, minimum maintenance costs, and efficient steam generation. This is not always realised, neither is the fact that the formation of a relatively thin film of scale may have deleterious effects out of all proportion to what might be expected. In the case of water tube boilers it is being found everywhere that for real efficiency water is required that is pure, slightly alkaline, and handled in such a way that no appreciable solution of air takes place.

In connection with industrial boiler plant the Paterson Engineering Co., Ltd., manufactures water softeners in many up-to-date designs. For example, in its lime and soda ash water softening plant, separate closed pressure sand filters are used instead of the ordinary wood wool filters, thus ensuring softened and absolutely clean water. Paterson lime and soda ash softening plants, which are equally suitable for cold and hot water, are supplied with vertical or horizontal reagent tanks. The precipitate takes any desired time up to six hours to settle—largely depending on the magnesium content of the water. Other features are the choice of self-contained wood filters or the separate closed pressure sand filters; the method of preparation of the reagents at ground level or on top of the reaction tank, as required; and the discharge of the sludge either in the wet state or through filter presses to obtain dry cakes. In all cases, except in very small plants, the "Osilameter" by-pass reagent gear is included; this operates automatically, varying the amount of reagent according to the flow of the water, while the proportion added per unit volume can be varied instantly by adjusting a wheel valve. Further, lime and soda ash plant can be operated in series on the dual principle with base exchange plant using a material known as "Basex," which gives zero hardness.

The Advance Guard of Industrial Revival

Imperial Chemical Industries' Progress in 1932

PRESIDING at the sixth annual meeting of Imperial Chemical Industries, Ltd., at the Central Hall, Westminster, on April 11, Sir Harry McGowan, chairman and managing director, gave an illuminating review of the trend of industry in general during the past twelve months and spoke hopefully with regard to the future of the company.

The chairman, in moving the adoption of the report and accounts, said that 1932 in some respects was a mixed year. The storm of the economic depression continued to rage throughout the world, and we might be thankful that in these islands we had been, as it were, within the shelter of a protected harbour. While not immune from the further fall in prices, from the further additions to the network of obstructions to international trade, or from the anxieties attendant upon the fluctuating values of national currencies, Great Britain had achieved a measure of stability in the volume of her internal trade and had also comparatively improved her position in international markets.

Expansion of Home Business

The general recovery in the volume of business in each of the company's eight manufacturing groups was to be attributed in the main to an expansion of the volume of home business. It had been made possible by the more stable financial conditions provided by the abandonment of the gold standard and the check to indiscriminate imports arising from the imposition of a general tariff. In many products I.C.I. exports showed a satisfactory increase over 1931, thus improving upon the general British average. The under-valuation of sterling on the world's exchange markets had in many cases added to their competitive power, especially against countries adhering to the gold standard. They had also benefited by the increasing advantages flowing from the continuous improvement in their selling organisations, both at home, and in overseas markets.

The net profits of the year, after providing £1,000,000 for the central obsolescence and depreciation fund and £686,351 for income tax, amounted to £4,729,072, showing an increase of £1,320,782 or 38 per cent. over the preceding year. The improvement was attributable to three factors. The first was the increased volume of business arising from the tariff and monetary changes mentioned. The second was the realisation of many administrative economies which had been put into effect, and the third was the further progress in the reduction of costs. These reductions arose partly from the expenditure of capital upon installations of improved machinery and plant, and partly from better processes of manufacture developed as a result of heavy annual expenditure upon research.

Maintenance of Plant

The company had continued its policy of fully maintaining all plants in a condition of the highest efficiency, as a normal charge against revenue. During the six years of the company's existence their total charges against revenue, on account of the maintenance of the manufacturing assets of the eight groups, had exceeded £12,000,000. Further concentrations of manufacture had taken place, notably in the alkali and leathercloth groups. Similar steps were in progress in the metal group. These concentrations were only effected after close studies by their technical and commercial advisers of all the factors involved. In no case had they had any reason to regret the action taken.

New capital expenditure during the year upon manufacturing plants had been restricted to those cases where, even in existing depressed conditions, careful estimates of the market, of prices and costs, had justified their embarking upon the venture. So long, however, as world trade showed its present contraction, so long as the artificial obstructions to its free flow were continued, there was little likelihood of their spending any substantial sum upon new plant and machinery. The only exception related to the hydrogenation of coal into motor spirit.

Sir Harry reminded the shareholders that a year ago he said that the company might anticipate few disadvantages and many advantages from the historic fiscal change which had taken

place. After a year's experience of the working of the Import Duties Act, he was satisfied that this forecast had been amply justified. As a direct consequence of the Act they had been encouraged to start up a number of new manufactures. In other cases they had promoted research work on new projects which would not otherwise have been started. Both directly, by the replacement of imported materials competitive with their products, and indirectly, as a result of new business accruing to customers by reason of decreased imports of their products, substantial advantages had been obtained by the company. The Imperial Economic Conference held at Ottawa last summer was of too recent a date for any attempt to be made to estimate the results which might be expected to follow the agreements there signed. The great achievement lay in the discussion of these agreements.

Overseas Markets

The three great Dominion companies in which they were largely interested, namely, Imperial Chemical Industries of Australia and New Zealand, Canadian Industries Ltd. (in which they were interested with E. I. du Pont de Nemours & Co.), and African Explosives & Industries Ltd. (in which their partners were the De Beers Consolidated Mines Ltd.) continued to make satisfactory progress.

Referring to international agreements, the chairman said the arrangements in regard to dyestuffs had functioned very satisfactorily. Chaotic conditions of competition in the world nitrogen industry continued during the first half of 1932. Following many international conferences, however, an agreement between the principal producers had been made for the fertiliser year ending June 30, 1933. In these discussions and arrangements the Chilean producers participated. Economic and financial conditions in Chile, as a result of the world depression, were extremely difficult, but he hoped that benefits were continuous. They might be summarised as more producers of synthetic and natural fertilisers would lead to a continuation of the present world arrangement, so that this important industry might work upon a satisfactory basis.

All the research laboratories of the company had been kept in full commission throughout the year, and the collaboration established between the Universities and the chemical industry had continued to be of mutual advantage. Their annual expenditure in this country on technical research exceeded £500,000. This was all charged against revenue. Its benefits were continuous. They might be summarised as more economical manufacturing processes, improved outputs, finer products, more efficient technical services to customers and the development of new commodities. The major part of the expenditure was directed to these ends, but they did not neglect pure research in the chemical and other sciences which lay at the root of their industries. They were paying more and more attention to research on the commercial side which constantly provided a stimulus to technical research. In their view investigations of markets and potential uses for their products and of the economic conditions underlying changes in demand were of paramount importance to-day.

New Products

Recently the company's new products had consisted mainly of those which had previously been reported. So far as the manufacture of heavy chemicals was concerned—and under this head must be included nitrogenous fertilisers and heavy organic products the use of which was so rapidly growing—this country was now self-supporting. It was with much satisfaction that they began to feel the power of their efforts in technical research, aided by their commercial and economic investigations, to advance towards new manufactures which could be relied on to extend their prosperity in years to come. The rate of new discovery increased rather than slackened the influence of chemical products and technique on agriculture, on the transport and conservation of foodstuffs, on textiles, and still more recently on building products, was sufficiently great to assure them of a progressive forward policy within their legitimate field. They had participated with an important section of the white pigment industry in a company which would manufacture titanium

white. Considerable progress had been made with inventions to promote the use of their solid carbon dioxide refrigerant, Drikold. In the building industry, they were engaged with the British Steelwork Association in studying the incidence of new products and new methods of construction on the prospect of replacing unsuitable housing. Re-housing offered, in his opinion, one of the most promising avenues to a large-scale reduction of the unemployment which existed to-day. The problem would be most efficiently solved by the application of large scale productive methods in order to secure the essentials of equally satisfactory but economically cheaper forms of housing accommodation. Only by these methods could costs be brought down radically. The new equipment of the metal group had made possible the rolling of zinc on a considerable scale. A growing demand for an explosive for coal-mining which would give a bigger yield of round coal had been successfully met by their new low-density type of explosive.

Hydrogenation of Coal

They had continued their research work on hydrogenation with marked success. There was no foundation for the general suggestion that the direct hydrogenation of coal was unsound economically by comparison with carbonisation of the raw coal first, followed by the hydrogenation of the resulting tar. Their technical staff was still working on the direct hydrogenation of coal. They were satisfied that this was the correct policy. It did not preclude the use of tars as they became available in suitable quantity and at suitable prices. In fact, they foresaw a definite field for tar hydrogenation as well, which should be of great assistance to the carbonisation industries. Large scale commercial development of the company's hydrogenation process now only waited upon progress in regard to a limited number of economic factors. When that was achieved they would be prepared to invest a substantial sum out of their present liquid resources upon this enterprise.

The remedy for unemployment was partly to be found in the establishment and extension of new industries. In these days some security of tenure through Government measures was essential. The tariff partly provided the mechanism, but old or revenue duties were still subject to all the uncertainties of annual budget requirements. This defect should be remedied by appropriate transfers between the two categories of import duties. Encouragement should also be given to capital outlays on new ventures by a more elastic system of income tax allowances for wear and tear of the plant employed. The Crown could not properly reply that the Income Tax Acts provided an allowance for obsolescence of plant, because that allowance only became effective if new expenditure was incurred on replacing the obsolete plant.

Government Must Meet Industry

New ventures which did not succeed did not renew their plant, and thus had no means of obtaining the allowance. In that event, the provision was an empty shell. The Royal Commission on the Income Tax recognised this in its recommendation that an allowance should be granted in respect of obsolescence for machinery or plant, disused for any reason, whether replaced or not, except where the disuse was the result of the discontinuance of a business. New enterprise meant fresh employment, but it also meant risk. The Government shared the profit of success, but declined to share the risk of failure. These wear and tear obsolescence provisions should be enlarged and modernised to encourage new capital expenditure. The Government must meet industry in these matters if it desired to make an effective contribution to new enterprise. Industry for its part should assist by lowering the expectation of normal return upon the capital expenditure within the bounds of reasonable safety.

Having referred with satisfaction to the recent restoration of wage cuts, Sir Harry said, in the long run, the prosperity of every company depended upon personnel. It was the company's task to recruit, train and organise personnel in such a manner that the right man should be in the right job, and that the company should never lack high officials of great ability, thorough training, wide outlook, keen initiative and sound judgment.

At the moment, the United States of America was in the midst of a financial crisis almost unprecedented even for that country of great financial movements. The outlook was

obscure. Under the courageous and drastic leadership of President Roosevelt, energetic steps were being taken to cope with the complex aspects of the crisis. However successful these efforts might be, that country had, he believed, to face a period of liquidation, the immediate outcome of which might be, not an improvement in general world economic conditions, but an accentuation of present difficulties. The great fall in prices had depreciated or destroyed a large volume of the assets upon which her purchasing power rested. The reaction of these events and their solution upon the complex problem of international debt payment was obscure. World competition in exchange depreciation made what remained of international trade often an uncertain gamble. Restrictions on exchanges, increased protective duties, the applications of quotas, the establishment of bi-lateral clearing arrangements and other barriers to international trade, as well as the wide abandonment of the gold standard, were all intimately connected with the great problem presented by the contrast between the abnormal fall in the prices of primary commodities and the unchanged volume of liability arising from the huge international network of debts. Until some fuller measure of agreement upon the necessary methods and machinery for dealing with this problem had been achieved, it was impossible to form any estimate of the future.

Promise of Continued Prosperity

They could, however, rely upon the sanity, steadfastness and cool courage of their people, so that while industry, even in the home market, might still have to sustain further shocks arising from world conditions, they could be fairly confident that Great Britain was in some measure sheltered from the blast. Although the volume of their business in the current year showed in some directions a small comparative fall, he thought, from their experience of the past years of this depression and their knowledge of the present, that they could look hopefully forward to the results of the year 1933 and to the continued prosperity of the country. Though the benefits of a paper money standard and tariff protection might prove transitory in this changing world, efficiency in administration, manufacture and distribution would hold fast through every emergency. To-day there was almost unanimity of agreement on the necessity of international co-operation in solving present economic problems. The deliberations of the Monetary and Economic Conference must be carried on in the spirit of Lincoln's words, "with malice toward none; with charity for all." Future welfare would require present sacrifices. Success founded on this attitude would quickly lead to a revival of world confidence and enterprise in the benefits of which they, as an international trading organisation, would fully and rapidly share. Apart from these hopes no effort would be spared by the company to maintain and to expand its markets, to develop new activities and new products, to improve its processes and develop its research.

Lord READING, president of the company, seconded the adoption of the report, and expressed the hope that the past year's results of the company would prove to be the advance guard of a general industrial revival in this country and throughout the world. He also stressed the need for increased Government support in the interests of new enterprises.

Lord Reading, Lord Weir, Dr. W. H. Coates, Mr. J. Rogers and Mr. B. E. Todhunter were re-elected directors. A vote of thanks was accorded to the directors, staff and workpeople for their services during the past year.

Chilean Nitrate Position and Sales

It is reported that sales of Chilean nitrate during the eight months ended February 28 were approximately 100,000 tons in excess of sales during the corresponding period of the previous nitrate year. In order to relieve unemployment in the nitrate field, companies and the Chilean Government have agreed to increase employment in several plants. The oficina Mapocho, now owned by Sabioncello, will increase its production of potassium nitrate for which there appears to be an active demand. The oficina Maria, owned by the El Loa Nitrate Co. will take on more workmen for the purpose of gathering caliche but will not increase production of finished nitrate. The Santa Luisa oficina, a Shanks plant, which has been operated by the Lautaro Nitrate Co. plans to take on more workmen.

Letters to the Editor

The Editor welcomes expression of opinion and fact from responsible persons for publication in these columns. Signed letters are, of course, preferred, but where a desire for anonymity is indicated this will invariably be respected. From time to time letters containing useful ideas and suggestions have been received, signed with a nom-de-plume and giving no information as to their origin. Correspondence cannot be published in THE CHEMICAL AGE unless its authorship is revealed to the Editor.

A New Dyers' Federation

SIR.—As secretaries of the Silk and Artificial Silk Piece Dyers' Federation, we are instructed by its members to intimate to you the circumstances which have led to the necessity for such an organisation, and also its aims and objects. It will be recognised that for some time past dyeing prices have precluded the possibility of dyers securing any adequate remuneration, and it is felt that it is not only in the interests of the dyers, but also of the merchants, that prices should be stabilised. Under present conditions it is impossible for manufacturers or merchants to arrange a programme or future policy without undertaking serious risks.

The Federation, which already includes about 90 per cent. of the firms engaged in the dyeing and finishing of silk and artificial silk fabrics, has agreed to work together under the same conditions of trading, and on the same list of prices, which have been compiled on an economic basis with a view to stabilising prices at a seasonable level. The trading conditions and prices arranged will be announced within the next few days. The prices will come into operation as and from May 1, 1933.

The scheme, from its inception, has had the goodwill and approval of a considerable number of merchants engaged in the trade, as they feel, like ourselves, it is the only method by which the industry can be put, and maintained, on a sound stable foundation. May we assure you, as a Federation, of our wish to be constructive in every way possible, and that any suggestions put forward by merchants to the Federation, in their mutual interests, will have the immediate consideration of the members and the executive.—Yours faithfully,

WENHAM BROTHERS AND CO.,

Secretaries.

21 Spring Gardens, Manchester.

Research and Industry

SIR.—The discussion in your columns concerning the difficulty experienced in connection with research and the rubber industry marks a phase in the development of research stations and their value to-day when so many private concerns engage in systematic research themselves. Many years ago I tried unsuccessfully to interest leading textile manufacturers in a scheme for the setting up of a research laboratory for the textile industry at the Imperial College of Science and Technology, having persuaded the then Rector of that College, Sir Alfred Keogh, that such a centre would be a satisfactory one for such a venture.

Following an unsuccessful attempt to raise quite a small sum of £1,000 a year for that purpose, I subsequently went to Sir (then Mr.) Frank Warner and suggested that the Silk Association, for which I then acted as hon. consulting chemist, should undertake a scheme of research which would be supported financially by members of that Association. Here success resulted, largely through the energetic work of Mr. Warner, who was then its president. I got out a general programme of procedure which was published in their journal and we then got in touch with Professor Percy Groom, of the Imperial College, and through this, the first scheme of research of this kind was stated there, Dr. Schriber having charge. From this early development, came the general scheme which now embraces so many industries. This first work in 1915 ("Journ. of Silk Assoc." No. 31, pp. 18-21) subsequently received the first Government grant for this kind of work. The scheme then suggested has been also set out in your columns (January 4, 1930), so it need not be referred to again in detail.

Possibly circumstances have altered through the greater interest taken by individual firms in research, and the fact that such private research remains the property of the individual firms and does not become the property of the industry as a whole. But, as pointed out by Dr. Schridrowitz and Dr. Stevens in your last issue, there are many problems which interest an industry as a whole, and much research still to be completed of this nature; and undoubtedly the value of

such research centres remains, especially when—and this is the point—such research originates from a definite demand for information, which would be useful in the industry itself.

The first scheme mentioned above came direct from the mill and the dyehouse, and beyond question an industrial scheme should be *industrial* in its aims, objects, and programme of research. Criticism has undoubtedly been directed against certain activities at certain centres where in some work the industrial aim and object has been—to say the least—somewhat obscure. Where work is done which could be equally well done, and possibly more satisfactorily placed, at the university or college, the argument that such work properly belongs to the college, and should be undertaken there, and that it could be carried out at far less expense, requires investigation.

It should be definitely settled in an authoritative way, what kind of work should be carried on in the research centres, and what at the colleges. Also, whether private laboratories cannot, as suggested recently by Lord Melchett, make a far better selection of the problems dealt with than a research station can. Undoubtedly this is an important point, and one which was before us when the first scheme was started. Lord Melchett's words are worth quoting:—"Industrial research is an intensely practical matter. You must set out with a very definite aim, and that aim must always be kept in view. It is only natural that firms which are engaged in some particular branch of industry with all their specialised knowledge behind them, should be better able to choose a suitable object of research than some general body of research workers with the entire horizon of the unexplored before them. So research work should originate from individual units."

In a recent leader, you rightly point out that "educational authorities throughout the country should accept industrial experience as an important qualification for teaching posts in science." I would go further, and say that all teachers should be obliged to spend a year or two in some industrial centre or works as part of their training. One knows that this is objected to, on the grounds that during this time the teacher would lose the value of continuity in his work; but this argument cuts no ice, when one remembers, what the teacher is supposed to teach to-day to students who have to get their living subsequently, by utilising the knowledge and experience which they have gained in the college.

I suggested years ago that to reduce this difficulty, and to set a definite standard for the training received, the departments should be renamed. For instance, the chemical department should become the department of chemical research, and so on. Also that research should be definitely *taught* in these departments, in class, or otherwise. Some college departments hold that much of the work carried out in the research stations could and should be carried out in such departments, and that this would be a real advantage to the students, who were being trained there.

On the other hand, the works laboratories undoubtedly possess a definite advantage, when subject matter for research is being selected; and when this is left to chance or general selection much time may undoubtedly be wasted and work carried on which is of far less significance, and value, than it might be, were this practical factor taken into account. All interests should be consulted, and changes introduced, if these be found necessary; and a definite scheme worked out which would include all sides of research so that all parties feel that they play some part in a common scheme. The future of industry demands that such conditions should rule in research; so that the maximum advantage can be secured from research, and invention. It will not do for different interests to be pulling in different directions; and it would be a great advantage if all industries were so convinced of the value of research that Acts of Parliament could be done away with, so far as these *compel* firms to support research stations; and all came in believing that they gained great advantage.—Yours faithfully,

W. P. DREAPER.

Chemicals for Analysis, Research and Industry

A Wide Range of Products of British Manufacture

This article is based on information received from Hopkin & Williams, Ltd., whose exhibit at the recent British Industries Fair represented the several classes of chemical products herein discussed.

It is not many years since the cautious analyst would insist on reagents of foreign origin and put his trust in no other products when work of particular importance was in hand. Indeed, previous to the year 1911 no English company had published specifications for their own analytical reagents, though Dr. C. Krauch's "Die Prüfung der chemischer Reagentien auf Reinheit" was translated into English in 1902 by J. A. Williamson (chief chemist to Baird and Tatlock, London, Ltd.), and L. W. Dupré. In 1911, Edmund White wrote the first edition of "Analytical Reagents, Standards and Tests" and the manufacture of these reagent chemicals was taken up by Hopkin and Williams, Ltd. This was the first step in an enterprise which was eventually to provide a complete range of analytical reagents enjoying the implicit confidence of the chemical profession in this country.

Progress in Reagents

Analytical technique is as subject to change and improvement as almost any other branch of science. The reagents which were satisfactory in 1911 are not pure enough or sufficiently numerous for 1933. The consequent need for revision and extension of the specifications has been adequately met as second and third editions of "Analytical Reagents, Standards and Tests," made their appearance in 1925 and 1931 respectively. A perusal of the current edition of this publication will convince the chemical practitioner that the British fine chemical industry has thereby achieved a standard of purity of which it may justly be proud. It must be remembered that the manufacturer has first been under the necessity of devising tests which will preclude all impurities which may be objectionable from the customer's point of view. Then he has had to make the reagents, not in glass beakers and flasks, in a laboratory, but by the hundredweight in a chemical works, whilst dealing with impurity limits, in some cases, of a few parts per million. It is not surprising, therefore, that the works where such substances are produced is of a unique type, being virtually a large chemical laboratory where every possible precaution is used to ensure the purity of the product manufactured.

The range of products from these works amounts to several hundreds, among which there are nearly two hundred A.R. chemicals. It may readily be imagined that the need of careful control over this diversity of products necessitates the employment of a large and efficient staff of chemists. This technical staff is engaged, not only in the supervision of existing processes but in the investigation of proposed new manufacturers, for the list of products of this type of business is subject to a rapid mutation which reflects the increasing rate of change and progress of the modern scientific and industrial world.

Special Industrial Chemicals

It comes about incidentally that the manufacturer of reagent and research chemicals is equipped, in respect of both plant and staff, for the production of a particular class of industrial materials for which an increasing demand has arisen of late years. In many of the industries a need has arisen for materials a little purer in quality, a little different in physical form, or a little different in chemical composition from the standard product of the maker of heavy chemicals. Alternatively new products are required, often a combination of base and acid or an organic compound hitherto found only in the academic text book. This substance is then one which falls into the special sphere of Hopkin and Williams, Ltd., for it has for some time past been the policy of this firm to offer co-operation with their clients' chemists and technicians in the draughting of suitable specifications to cover the supply of such special requirements.

Just as in the case of reagents for analysis the chemist stipulated that his supplies must be foreign, so the research worker of a few years ago found it necessary to preface his paper in the scientific journal with the statement that his starting materials were of alien and therefore reputable

origin. It is gratifying to find that nowadays much more frequent mention is made of British materials. Here again, a closer co-operation has come into being between manufacturer and client, between the manufacturer's research chemists and the research institutions and colleges. In response to the increasing confidence reposed in their organic chemicals for research and analysis, Hopkin and Williams, Ltd., have considerably extended their facilities for the production of these substances. Special laboratories have been equipped for the synthesis of an extensive range of organic chemicals, whilst others are prepared in a pure state from the technical products of the manufacturer of dyestuffs intermediates. Modern indicators for hydrogen ion determination also receive special attention. Laboratory conditions obtain throughout these departments, the finished products being also subjected to appropriate analytical examination before sale.

Organic Reagents for Metals

One of the most interesting developments in modern analytical technique is the introduction of a new class of reagents for the detection or estimation of metals. Many of these organic substances are characterised by the extreme sensitivity of their reactions with certain metals. Copper, for instance, may be detected in as low a concentration as one part in one hundred millions by means of sodium diethylthiocarbamate. Other organic reagents, such as 8-hydroxyquinoline and α -benzoin oxime provide volumetric or gravimetric methods superior in certain respects to the classical methods. Sensitive colorimetric methods are afforded by others. Endless instances of the extreme usefulness of such reagents might be quoted, but it is sufficient to mention here the applications to the testing of foodstuffs for metals in which they have been prepared or packed, the analysis of water supplies and biological fluids. Hopkin and Williams, Ltd., have now placed on the market a comprehensive range of these compounds. Further, the research laboratory of the company has investigated the reactions of the substances and has published recommended methods for their application in a volume entitled "Organic Reagents for Metals."

Petroleum Chemistry

American Chemical Society Papers

THE available methods for computing the densities of hydrocarbon liquids and vapours at any given temperature and pressure were reviewed by E. W. Thiele and W. B. Kay at the 85th meeting of the American Chemical Society (Petroleum Chemistry) held March 26 to 31. For vapours at low pressures, where the question is one of molecular weight, mean boiling point affords a rough correlation, but actual molecular weight determinations on the particular type of stock are necessary for accurate correlation with any given property. For vapours at high pressures, the curves of Cope, Lewis, and Weber are good, but they require a knowledge of the critical pressure, and this is not readily calculable. For liquids, a new set of curves was presented, based mainly on the work of Jessup. These curves require a knowledge of the density at 60° and the viscosity.

Another paper by E. W. Washburn outlined briefly the methods which are now being utilised in fractionating petroleum into its constituent hydrocarbons. The methods include distillation under controlled pressure, crystallisation with and without an added solvent, extraction with liquids, and chemical treatment. A list of the hydrocarbons isolated was given together with the purity of the best sample obtained and an estimate of the amount present in the crude oil.

A third paper by T. S. Perrin and J. R. Bailey dealt with the separation of aromatic and non-aromatic bases from closely cut fractions of California kerosene, by "cumulative extraction" which has been successfully accomplished through the wide differences in the distribution ratio of their hydrochlorides between water and chloroform.

The Plasticity of Paints

Some Observations on the Effect of Storage

DEALING with the effect of storage on the plasticity of paints, in a paper read before the Oil and Colour Chemists' Association, in London, on April 6, Mr. S. A. de Lacey, A.I.C., pointed out that the opinion that the storage of paints results in its thickening is not unusual and in the absence of any reaction between vehicle and pigment the most reasonable explanation is the free access of air to the vehicle in the period between the opening and closing of the container for any purpose. It had been stated that thickening occurs in sealed containers during storage, and in consequence of this it had been found necessary to conduct experimental trials to determine whether such thickening was likely to occur and if so, whether it was possible to devise an accelerated storage test which would reveal the tendency. The object of this investigation was to obtain data on the flow of paints under pressure through capillaries, in order to detect any change of their plastometric characteristics during normal or artificial conditions of storage. For this purpose a pressure plastometer was devised which could easily be constructed from laboratory apparatus, and paints representing various types in common use were examined, including several which were considered likely to thicken during normal storage. In an attempt to accelerate thickening, elevated temperatures were used and the results compared with those obtained during normal storage of long duration. In some cases, the effect of low temperatures was also examined. A series of "pinhole" tests was also carried out to ascertain the probable effect of a small leak in the paint container.

In the first experiments with paints representing two classes, *viz.* red oxide and white lead, and white enamel and undercoat for white enamel, the samples were sealed in containers, one being kept at normal temperature for plastometric examination on the following day, the other being placed in an oven at 50° C., in some cases followed by a further heating at 30° C. At time intervals of 14, 28 and 90 days, one container holding a paint of each type was withdrawn from the oven and allowed to stand for two days. The container was then unsealed, the paint being prepared for the plastometer and examined for any alteration in plastometric characteristics. The results showed that the red oxide and white lead paints thickened slightly and progressively when stored at 50° C. A slight thinning of the white enamel was revealed at 14 and 28 days but at the conclusion of 90 days at 50° C. it differed little from the original. The undercoat for white enamel thinned progressively during 14, 28 and 90 days. In no case was the drying time appreciably altered by storage. Tests with these paints sealed in containers but having a regular pinhole in its lid, showed a very decided progressive thickening after 28 and 42 days when heated at 50° C.

Heated "Pinhole" Tests

Tests were then carried out on brown undercoats (stoving). In some cases the heating trials at 50° C. were followed by a period of storage at 30° C. The pinhole trials were made by a single regular puncture in a paper cover fastened over the mouth of the glass container by means of shellac. The results showed a marked thinning effect on heating at first but this was arrested after 14 days' storage until a period of 90 days had elapsed. The heating was without effect, however, and there was a thickening on normal storage. The heated "pinhole" trials showed progressive thickening with the formation of a thin transparent skin on the surface of the paint; there was also slight thickening on normal storage.

Two series of four freshly-manufactured quick-drying paints were also examined. These were specially prepared and of a composition which was considered likely to result in thickening during normal storage. These paints were heated for periods of 35 and 70 days at 50° C.; they were also stored at normal temperature in hermetically sealed containers. In the case of priming, there was a slight thinning on heating and slight thickening on normal storage for 70 days. For red paint, there was thickening on normal storage for 70 days, equal to that resulting from 70 days' normal storage. White enamel thinned slightly after its first heating but thickened at the end of 70 days' normal storage. With ready mixed

white paint there was progressive thinning after 35 and 70 days at 50° C., but the paint thickened on normal storage.

From these results, the author concludes that the effect of storage at normal temperatures on the consistency of paints in hermetically sealed containers showed that only slight changes take place. No case of marked thickening was recorded and such changes as were observed were quite insufficient to affect the practical brushing qualities of the paint. The effect of temperature on the plastometric data of a white lead paint, however, was found to be important. Storage at elevated temperatures—30° and 50° C.—did not as a rule accelerate thickening and in several instances the paint became thinner. Experiments on four paints were also carried out at 0° C., but storage at this temperature produced little change in consistency. The investigations of a very small pinhole in the container showed that in several cases marked thickening of the paint took place under these conditions.

Points from the Discussion

The PRESIDENT said the Association had had a number of papers on this subject and it might be thought there was a tendency to devote rather more time to it than was warranted. It was, however, a very important matter. A special committee of the British Standards Institution was now revising the specification for methods of measuring viscosity and it was no secret that this committee was considering the extension of that specification to cover materials such as paint, and possibly others, which could not be examined in the ordinary type of Ostwald viscometer. What would come out of that work it was much too early to say but more and more people were realising the importance of these measurements and that if some form of standard apparatus could be devised it would make the whole matter a great deal easier and different observers would be able to compare their results much more accurately. The question of paints thickening on storage was a very practical problem and the results obtained by the author as regards thickening were, perhaps, a little disappointing because the amount of thickening, although it could be measured with the author's instrument, was in all cases of normal storage, quite small, *i.e.*, when the paint was hermetically sealed whilst a small pin-hole in the container led to rapid thickening. In a way that was re-assuring because it meant that if the container was properly sealed the chances were that there would be no thickening of ordinary normal paints. The industry owed its thanks to the manufacturer who supplied paints in a form that they were expected to thicken easily yet the thickening from the practical point of view was negligible. The attempt to accelerate this effect by heating was disappointing, as accelerated tests often were, because it did not imitate the effects of normal storage; indeed, in some cases, there was an actual thinning rather than thickening.

A Scheme of Co-operative Research

Dr. G. F. NEW said the paper was specially interesting in that it gave facts and avoided bombarding its readers with windy theories based upon very slender foundations, as was so often the case. The work undertaken by the author was very extensive and it was easy to suggest amplification for it. For instance, it would be valuable to know the constitution of the red paint, the brown undercoat, the white undercoat and the white enamel because small differences in the constitution of the medium or pigment made very large differences in the plastometric properties. The effect of heating might possibly be due to an increased dispersion effect, *i.e.*, the pigment was being more efficiently dispersed. That, however, was merely a theory. It would be exceedingly valuable if the association could launch out into a scheme of co-operative research on this subject because there was a tremendous amount of work to be done and it was impossible for one person or one laboratory to do it all. There might be a small committee which could apportion one pigment to each of say 10 or 12 different workers and each of whom could use half-a-dozen different mediums. If, in a year's time, the various results could be collected and co-ordinated we should have a very valuable mass of data.

Mr. R. P. L. BRITTON said it was unfortunate that the manufacturer of the paints tested made such excellent paints because there were plenty of examples in which a paint thickened beyond all possible use and to say that paints in general did not thicken seemed to be contrary to the facts from the ordinary practical point of view.

Thinning at High Temperature

Mr. T. HEDLEY BARRY thanked Dr. New for raising a point that had often been at the back of his mind, *viz.*, the need for co-operative research. In the first paper on this subject before the association, by Mr. Palmer, there was a plea for standard methods of analysis and it was suggested that one of the duties of the association was the formation of committees for work of that character. Now Dr. New had suggested something which even Mr. Palmer had not thought of in connection with paints and it served to show how we had progressed. Unfortunately, we had made no progress in the matter of co-operative research and it was to be hoped that Dr. New's suggestion would fall on fertile soil. Mr. Britton had mentioned it was inconceivable that a paint would not thicken even when kept in an hermetically sealed container, but he was inclined to think, from experience, that there were very few containers in ordinary practice that did not contain some kind of pinhole which led to the thickening effect and it was more than probable that the author was right in what he said when the paint was kept under ideal conditions, although he did not wish to be dogmatic on that point. The question of thinning at high temperatures also involved the changes which occur in the medium quite apart from the pigment itself. The cause of thickening when there is a pinhole in the container raised the question of what is involved in drying. There were four distinct processes going on, *viz.*, coagulation of the particles; gelation of the medium; the effect of oxidation; and the reaction between the medium and the vehicle. With such a complicated series of things as that it was not to be expected that a paper like this to cover everything, but the author had shown what could be obtained within the limits of what he had attempted and what was possible with a great deal more perseverance and patience than many people possessed.

Mr. DE LACY, replying to the discussion, said he had every confidence in the instrument he used and would be only too delighted to receive samples of paint from anybody and put them through the plastometer in the method described in the paper and to submit the results, without knowing anything about the origin of the paints.

Stereo-Chemistry and Physics

Professor Peter Debye gives the Faraday Lecture

THE Faraday lecture of the Chemical Society was delivered at the Royal Institution on March 29. Professor Peter Debye, of the University of Leipzig, took as his subject "The Relations between Stereo-chemistry and physics" and gave a brilliant exposition of certain methods used for the elucidation of molecular shape and dimensions, methods to which his own contributions, both in theory and in experimental technique, have been all-important.

Until comparatively recently, the two factors which essentially determine the dielectric constant of a substance were not clearly distinguished from one another, but Professor Debye showed how the total polarisation in an electric field is compounded of the natural polarisation inherent in the molecules themselves and of an induced polarisation, due to their electrical deformability; how the relative contributions of these two effects can be estimated by investigating the influence of temperature on dielectric constant; and how the magnitude of the natural dipole moment thus obtained can give valuable information on the degree and the nature of symmetry of the molecule. In the latter half of the lecture, he dealt with his pioneer investigations on X-ray interference patterns produced by isolated molecules, describing the technique, the application of the numerous necessary corrections to the experimental data, and the interpretation of the latter in terms of the inter-atomic distances in the molecule. Mention was made of the related electron ray method of Mark and Wierl. He illustrated his topic by reference to work on the chlorine substitution products of methane, and to the problem of free rotation of single bonds.

Indian Chemical Imports

Quarterly Statistical Summary

A SURVEY of the import trade of India, during the nine months ended December, 1932, as prepared by the British Trade Commissioner at Calcutta, has just been published by the Department of Overseas Trade (Ref. No. C.4090). During this period the value of the imports increased as compared with the corresponding period of 1931, by £5,250,000 or 8 per cent. and amounted to £76,500,000, and that of the total exports, including re-exports, fell by 18 per cent. to £74,250,000. The exports of Indian merchandise showed a decrease of £15,750,000 or 18 per cent.; re-exports also decreased by £7,580 or 34 per cent. The grand total of imports, exports and re-exports amounted to £150,750,000 as against £163,000,000, a decrease of £12,250,000 or 7 per cent.

The trade in chemicals continues to expand, the total imports increasing from £1,379,250 to £1,505,625 due principally to increased imports of sodium carbonate, caustic soda and potassium chlorate. No details are available of the countries of origin, but the following table gives particulars of the imports under the principal headings:—

	1931.	1932.
Acids	£39,375	£43,125
Bleaching powder	£52,500	£58,125
Calcium carbide	£43,125	£39,375
Copper sulphate	£16,875	£15,000
Disinfectants	£41,250	£41,250
Glycerine	£15,000	£12,750
Potassium chlorate	£31,875	£60,000
Sodium bicarbonate	£43,125	£39,375
Sodium carbonate	£343,325	£395,025
Sodium cyanide	£20,625	£18,750
Sodium silicate	£13,125	£11,250
Caustic soda	£181,875	£193,125
Sulphur (brimstone)	£97,500	£110,625

There is little change in the imports of drugs and medicines. In 1931 the total imports amounted to £1,044,375 and in 1932 they had been slightly reduced to £1,042,875. No details of the countries of origin are available, but particulars are given below of the principal items which make up this total:

	1931.	1932.
Camphor	£150,000	£142,500
Proprietary and patent medicines	£202,500	£204,375
Quinine salts	£135,000	£157,500
Saccharine	£11,250	£11,250

Due to the fact that a revised classification of dyes was introduced from April 1, 1932, it is not possible to compare the imports of individual items with imports during the previous year. The total imports of dyes obtained from coal tar fell slightly from 12,178,854 lb. valued at £1,263,750 to 10,447,724 lb. valued at £920,000, but no details of the countries of origin are available.

There has been a slight increase in the total trade in paints and colours from £360,000 to £378,750, the United Kingdom share being increased from £223,125 to £228,750. Imports from Germany and Japan increased from £43,125 and £20,625 to £48,750 and £37,500 respectively. There was a drop in the imports from the United States from £16,875 to £13,125, and from other countries from £54,375 to £48,750.

There has been a slight fall-off in the soap trade from 232,728 cwt. valued at £513,750 to 230,726 cwt. valued at £487,500, but the United Kingdom share was increased from 196,722 cwt. to 197,262 cwt. although the value fell from £431,250 to £416,250. The different kinds of soap imported during 1932 were as follows:—Household and laundry soap, 190,270 cwt. (£286,875); toilet soap, 34,324 cwt. (£183,750); other sorts, 6,132 cwt. (£18,750); making a total of 230,726 cwt. (£489,375).

Luminous Discharge in Hydrogen-Filled Tubes

MAGNIFICENTLY coloured luminous effects in electric discharge tubes containing hydrogen are observed when the gas is dried and purified to an exceptional degree by exposure to phosphorus pentoxide. The phenomenon is developed on passing a heavy discharge through the vessel which contains a substantial quantity of the dehydrating agent, and flooding the vessel with hydrogen at frequent intervals. Further details are given by Guntherschulze and Keller in "Naturwissenschaften," 1933, pp. 235-236.

The Quest for Purer Water

Annual Report of the Water Pollution Research Board

MANY of the factors which have operated towards reducing the pollution of rivers are reviewed in the annual report of the Water Pollution Research Board for the year ended June 30, 1932, issued by the Department of Scientific and Industrial Research (H.M. Stationery Office, 1s. net). The report shows not only that the investigations carried out by the Department have aided in arousing greater recognition of the benefits to be derived from reduced pollution of rivers and streams, but that they have achieved results of technical value which are now gradually being applied.

In the few years prior to the autumn of 1931, economic conditions operated in such manner as to result in increased activity in the preparation and carrying out of schemes of water supply, the provision of new sewage disposal works and the improvement of existing works. These schemes were partly inaugurated with the object of relieving unemployment. At the same time, the new sewage disposal works and the improvements in other similar works are assisting in keeping down pollution. The difficult financial situation which developed in the autumn of 1931 has led to some curtailment of activity on these schemes.

While the general depression in industry has caused reductions in the quantities of many trade effluents discharged into rivers and sewers it has also retarded progress in investigations of methods of treatment of certain trade effluents and, in other cases, the inauguration of such investigations. When there is a revival of industry pollution must increase unless further steps are taken to dispose of the various effluents or to avoid their production. There is undoubtedly a good deal of work ahead in the field of water pollution research before many of the problems involved can be satisfactorily solved. In addition, new problems must arise as the needs of the population change, as new industries develop and as existing methods of manufacture are modified.

Industrial Effluents

One of the difficulties in the prevention of pollution by industrial effluents is the general apprehension that it will involve an additional charge on industry. This is not necessarily the case, as there are circumstances in which waste waters can be re-used with resulting economies in the factory processes or products of value may be recovered from the wastes. Modifications of the factory processes can also frequently be made with the object of decreasing pollution. In addition to the considerations affecting the problems of disposal of the effluents from a particular factory, questions of more widespread interest arise. For example, there are many instances in which the unrestricted and uncontrolled discharge of polluting liquids from certain manufactories renders the water supplies most easily accessible to adjacent factories quite unfit, except after costly preliminary treatment, for the purposes for which they are required.

Useful work has been continued by the Institution of Gas Engineers in connection with the problems of disposal of the effluents produced in the carbonisation of coal for the manufacture of gas for public supply. The problem of disposal of gas liquor effluents has not yet been entirely solved, but the work already done has led to considerable improvement in a number of cases. As might be expected the methods adopted for alleviating the difficulties vary according to local circumstances.

Survey of the River Mersey

A new investigation of considerable importance concerns the deposition of solid matter in the estuary of the River Mersey. This deposition has for many years necessitated extensive dredging to preserve a navigable channel. In addition, it has been stated that the character of the deposits is such that dredging is frequently difficult. The factors which may affect the nature and amount of the deposits have for a long time been a subject of discussion between the various local interests. Accordingly, the Mersey-side local authorities, together with the Mersey Docks and Harbour Board, have approached the Department with an application for a scientific investigation into the effect of the discharge of crude sewage into the estuary of the Mersey on the amount

and hardness of the deposits in the estuary. The investigation is obviously one of great importance to the Mersey-side, not only as regards navigation but also in connection with local problems of sewage disposal. The experience gained in the survey of the River Tees would obviously be most useful in the conduct of such an investigation. The board has accordingly recommended that it should be undertaken by the department, the cost being borne by the bodies making the application. (The recently issued annual report of the department states that a preliminary programme for this investigation is being drawn up covering work estimated to cost between £15,000 and £20,000.)

Beet Sugar Factory Wastes

Although the beet sugar industry had only recently developed in Great Britain, there were already cases of pollution of rivers in 1927. From 1927-1930, laboratory experiments were conducted at the Rothamstead Experimental Station and semi-commercial scale experiments were carried out at the beet sugar factory at Colwick.

From the results of these experiments it has been decided that practical methods have been devised whereby pollution of water caused by beet sugar factories can be avoided. It is possible for the majority of factory waste water to be re-used and any portion which cannot be used, can be purified by biological filtration. One of the objects of the recent experiments is to determine whether the efficiency of a biological filter can be improved by first inoculating it with specially selected strains of bacteria.

Preliminary experiments have now been begun on the treatment of liquid wastes from dairies, a problem similar in many respects to the purification of effluents from beet sugar factories. A certain amount of work has also been done on the factors affecting the results of the test for the quantity of dissolved oxygen taken up by effluents in five days. This test is frequently the best available for measuring the polluting character of an effluent or the progress of the purification achieved by the process of biological filtration, but experience has shown that it is frequently liable to give uncertain results.

Effluents in the River Tees

The survey of the River Tees is now far advanced and data are now being correlated for the preparation of the final report. Considerable attention during the past two years has been devoted to the systematic observations of the death of salmon and smolts at various periods and to examining the different kinds of effluents and their effect on the river and on fish life. The most important effluents, as regards toxicity, were those produced either by the washing and cooling of crude coke oven gas or during the distillation of crude ammonia liquor resulting from the carbonisation of coal. The effluents from the distillation of ammonia liquor owe their toxicity almost entirely to the tar acids they contain. On the other hand, the effluents derived from installations of coke ovens in which ammonia is recovered by the so-called direct process contain relatively small quantities of tar acids and their toxicity is due principally to the presence of cyanides. Both tar acids and cyanides have been found in a large number of samples of water taken from positions in the estuary at which smolts were killed in 1930 and 1931. None of these samples contained tar acids in concentrations sufficiently high to be toxic to smolts, but many of them contained cyanides in lethal concentrations.

Further evidence of the effect of cyanides in poisoning trout or smolt is provided by the colour of the gills which becomes markedly brighter. "This effect," the report states, "was produced by no other poisonous substance known to be discharged into the estuary. During the migration period of 1931 about 200 dying smolts were examined, their gill colours being compared with a series of standard colours. Other smolts were revived in fresh water in tanks and the gill colours of the normal fish were recorded. The comparison showed a marked brightening of the gills of the dying fish, a further indication that they were suffering from cyanide poisoning." The report adds that "it has been definitely

concluded that during the migration periods of 1930 and 1931, the mortality of smolts in the estuary of the Tees was caused primarily by the toxic action of cyanides contained in coke oven effluents. This conclusion marks a distinct step forward, for so far as is known, it has never been previously suggested that cyanides are responsible for the death of fish in the River Tees."

The question arose as to what steps could be taken to prevent the admission of cyanides into the river. The two most promising methods suggested were first examined in laboratory experiments made in co-operation with I.C.I. (Fertiliser and Synthetic Products), Ltd., Dorman, Long and Co., Ltd., and the Cargo Fleet Iron Co., and were later tried on a semi-technical scale at a coke oven plant where facilities were provided by Dorman, Long and Co., Ltd. These experiments have shown that coke oven effluent containing cyanide can rapidly be rendered innocuous when tested in 1 per cent. solution by mixing it with pre-determined quantities of spent pickle liquor and lime, or the cyanide can in large measure be removed by spraying the heated effluent in the form of a fine mist.

Spent pickle liquor is now obtained in large quantities as a waste product from certain processes of cleaning iron and steel, and at the present time, according to this report, it is discharged in appreciable quantities into the River Tees, when the ferrous chloride it contains is oxidised and precipitated without affecting the cyanides which may be present.

A further study has been made of the factors affecting the rate of disappearance of toxic substances in estuary water. The accelerating action of sewage on the decomposition of phenolic substances under aerobic conditions is striking. The

rate of disappearance of cyanides under similar conditions does not, however, seem to be accelerated by the presence of sewage. In this connection it has been found that cyanides, even in small concentrations, partially inhibit the decomposition of sewage, whilst tar acids are themselves decomposed.

Contamination by Lead

The taking up of lead by drinking water during passage through service pipes to consumers has on many occasions been the cause of considerable trouble in different parts of the world. A comprehensive summary of the literature dealing with this subject has been made at the Department's Chemical Research Laboratory, and as the result, some of the main features of the problem have been selected and experiments have been begun in the laboratory. These include a study of the rate of attack of lead by different waters; an investigation of the influence of methods of cleaning specimens of lead on the subsequent action of waters on the metal; and a third series of experiments will deal with the effects produced by electric power leakage to leaden water pipes. In this connection the report states: "It is a common practice of electricians to 'earth' the metal conduits in which cables are enclosed by connecting them to leaden water pipes with the object of minimising risk of shock from accidental leakage. From the viewpoint of water supply it is desirable to ascertain what amount of leakage may occur without causing the water to take up such quantities of lead as might be deleterious to public health." Experiments with this object have, therefore been begun, and the results are awaited with great interest.

Chemical Industry Lawn Tennis Tournament

Enter at Once

LAWN tennis players in the chemical industry are reminded of the approach of the closing day for entries for the third annual Chemical Industry Lawn Tennis Tournament for THE CHEMICAL AGE challenge cups. Only another fortnight remains before the draw for the first rounds, and all entries should be forwarded as soon as possible. All men engaged in any capacity in the chemical industry in Great Britain are eligible to enter. Inaugurated by THE CHEMICAL AGE in 1931, the tournament is extended this year to include singles as well as doubles. There is no entrance fee and the only restriction is that in the case of the doubles, each pair must be members of the same or an associated firm. Entry forms may be ob-

tained on application, either personally, by post or telephone, to the Editor of THE CHEMICAL AGE, Bouverie House, Fleet Street, London, E.C.4 (City 0244).

The draw for the first round will be made as soon as possible after the closing date for entries, and it is hoped that full particulars of the draw will be published on May 6. As in previous years there will be a new draw for each round. In the early stages of the tournament the country will be divided into areas, the geographical limits of which will depend upon the number of entries from each locality, in order that the difficulties of travelling may be minimised. Following are the rules of the tournament:—

Rules

1. Every competitor must be a member of the chemical industry, either as a principal or a member of a staff. There is no entrance fee of any kind.
2. Each pair in the Doubles Tournament must be members of the same, or an associated, firm.
3. The Challenge Cups shall be competed for annually on courts of any surface in accordance with the Rules of Lawn Tennis and the Regulations of the Lawn Tennis Association. The winners of the Cups shall make arrangements for their safe custody and insurance.
4. The competition shall be conducted on the knock-out principle, and the best of three advantage sets shall be played in all matches, except in the Final of the Singles, when the best of five sets shall be played.
5. Entries shall be made not later than May 1, 1933, and addressed:
 "Lawn Tennis Tournament,"
 "The Chemical Age,"
 Bouverie House,
 Fleet Street, London, E.C.4.
6. The draw shall be made on the first convenient day following the close of entries. The dates on or within which the several rounds must be played will be published in THE CHEMICAL AGE.
7. The Editor of THE CHEMICAL AGE shall have the right to scratch any players who fail to play off their matches by the stipulated dates, or who otherwise fail to conform with the rules and regulations governing this competition.

8. Except in the case of the special period set apart for the final stages of the competition, players drawn against each other must make their own arrangements for playing off their match on a court mutually agreed upon. In the event of disagreement, the first name drawn shall have the right to choose the ground.
9. In the general interests of competitors throughout the country it has been decided to divide into areas as far as possible all matches up to, and including, the Semi-Finals, the rule as stated under Clause 8, however, still standing.
10. The result of each match must be sent by the winners to the Editor of THE CHEMICAL AGE, signed by all players (winners and losers) immediately after the match, and must reach the office of THE CHEMICAL AGE not later than by the first post on the day following the final day for playing off the round.
11. If any player be not present at the agreed place or time of the match, opponents shall be entitled to a walk-over, after having allowed reasonable time (say, a maximum of one hour) for the others' appearance. If the players find it impossible to play off their match on the day originally chosen, they must play it on any other day, to which both sides agree, within the stipulated period.
12. Any dispute arising between players, or otherwise, shall be referred to the arbitration of the Editor of THE CHEMICAL AGE, whose decision shall be final.
13. While competitors will make their own arrangements as to hard or grass courts for the preliminary rounds, it must be understood that the Finals will be played on hard courts.

Society of Public Analysts

Determination of Freezing Point of Milk

AN ordinary meeting of the Society of Public Analysts was held at the Chemical Society's Rooms, Burlington House, on April 5, the president, Mr. F. W. F. Arnaud, being in the chair. Certificates were read in favour of George V. Hall, Geoffrey Holland, Herbert S. Howes, Frederick W. M. Jaffé, and Malcolm M. Love. The following were elected members of the Society:—Gilbert F. Caley, William R. Dracass, and Y. V. Srikanteswara Iyer.

Mr. H. G. Rees read a paper on "Iron and Copper in Liver and Liver Extracts," and Dr. G. W. Monier-Williams presented a paper on "The Determination of the Freezing-Point of Milk."

In H. G. Rees's paper a summary was given of the amounts of iron and copper previously recorded for the livers and liver extracts of various animals, and it was shown that these metals had been incompletely extracted in the aqueous extracts. In the author's experiments the proportion of iron was somewhat higher, whilst the copper was very much lower than the figures given by Meyer and Eggert.

Dr. Monier-Williams discussed the various errors to which the measurement of the freezing-point of milk or of any aqueous solution is liable. The three main factors influencing the determination are super-cooling, the water-value of the container, thermometer, bulb and stirrer, and the heat-exchange with the surrounding medium. The author dealt with the nature and magnitude of the respective corrections which must be applied to ascertain the true freezing-point. With the new type of apparatus devised by the author the supercooling correction can be determined with a fair degree of accuracy.

New Uses for Bone Glue

An International Competition

THE International Association for the Study and Improvement of the Bone Glue Industry, commonly called "Epidos," with the object of finding new markets for the sale of bone glue, has decided to organise a competition with prizes for inventors, chemists, technicians or others, who discover new uses or new outlets for bone glue. Any person who so desires may take part in this competition, without any restriction as to nationality. In order to participate, competitors must give a description of their invention or improvement in the form of memoranda, which must be sent to the Epidos Secretariat, 58 Rue de Chateaudun, Paris, France. This memoranda may indicate the results of research for the purpose of using bone glue in the manufacture of new products, and products in the composition of which, hitherto, bone glue has not entered; alternatively it may indicate improvements in processes already using bone glue which will permit of the development of its use. Memoranda must be drawn up in either German, English or French. The amount of the awards to be compulsorily distributed will be 20,000 Swiss francs; apart from this sum a supplementary amount of 10,000 Swiss francs is reserved, which may be employed as an award for the author of a particularly interesting memorandum, giving prospect of a new and large consumption of bone glue, or to subsidise research for the development of such new process or invention. The jury will be composed of five persons from five different countries, who will be appointed by the Epidos Council from among the members of this association; five other persons will be appointed as deputy judges, under the same conditions. Memoranda must be received before February 28, 1934. The announcement of the results will be made by June 30, 1934. Further particulars are obtainable on application to British Glues and Chemicals, Ltd., Imperial House, Kingsway, London, W.C.2.

THE Dominion Bureau of Statistics at Ottawa reports that in 1931 a total of twenty-three Canadian plants manufacturing lead, tin and zinc products, had a production valued at £827,500, including 9,445 tons of various lead products, as well as non-ferrous metals recovered from scrap. Last year's output represented a decrease of 20 per cent. in value, as compared with 1930. The total capital invested in the industry is nearly £1,000,000.

A New Stripping Agent

Overcoming the Difficulties of Fast Colours

A NEW stripping agent for dyed materials was described by Mr. L. G. Lawrie, A.I.C., at a meeting of the Manchester Section of the Society of Dyers and Colourists, on April 7, when Mr. W. F. A. Ermen presided.

Mr. Lawrie said that he used the term "stripping" to indicate the removal of colour from materials which had already been dyed and in contradistinction to bleaching, with the object of producing a white material from the natural state. Stripping dyed fabrics was mainly carried out for one of two reasons, either to utilise already dyed material such as rags, stock remainders, etc., or to correct a faulty dyeing or printing. Both operations were of considerable technical importance, but the choice of method and the factors governing the stripping varied very considerably. The point need hardly be stressed that a faulty dyeing on expensive material which had eventually to be jobbed often resulted in a considerable financial loss. The methods of stripping hitherto available were based mainly on the action of reducing or oxidising agents which were quite effective for a large number of colours, but were ineffective for stripping the majority of the vat colours and quite valueless for stripping the fastest boiling azoic colours or Turkey red. There existed, therefore, a definite need for a new stripping agent which would attack these extremely fast colours without, at the same time, damaging the material itself.

During the course of experimental work on a series of entirely new compounds, it was noticed that some of them possessed, in conjunction with a reducing agent, a definite stripping action on certain of the fastest to kier-boiling azoic colours. The preliminary results appeared so interesting that all analogous compounds were examined and finally one of them was isolated and purified and its properties as a stripping agent examined in considerable detail. This compound had been called Decamine and would shortly be put on the market by Imperial Chemical Industries, Ltd.

No Bad Effects upon the Dyed Fabric

Decamine is a soluble alkyl amine in the form of a buff powder, readily soluble in water giving a neutral reaction and stable to acids and alkalis in the concentration used in textile practice and was not precipitated by hard water. It is unaffected by reducing and oxidising agents, but is precipitated by certain metallic salts. It possesses some affinity for textile fibres, but could be readily removed by means of a light soaping treatment. It did not appear to react with cellulose and therefore exerted no injurious action on such textile materials; on the contrary, it appeared to possess a softening effect on cotton. The preliminary experiments were made on the fast to kier-boiling azoic colours. The method adopted was to boil the dyed material in a solution containing Decamine and a little hydrosulphite and caustic soda. The dyeings used were those normally considered fast to a boiling treatment with caustic soda followed by chemick, and the remarkable result was that even heavily dyed materials were either bleached to a white or to a pale yellow decomposition product which was readily removed by a very mild chemical treatment. For example, the yellow obtained from Brenthol AT coupled with Fast Scarlet 2G Salt, and the red obtained from Naphthol AS/TR coupled with Fast Red TR Salt—two of the fastest combinations—could be readily stripped to a white by this treatment. Following up this discovery, it was found that not only the azoic colours but many other fast colours were also stripped such as Turkey red, Hydron Blue and many of the anthraquinone vat colours. Whilst, however, all the azoic colours tested appeared to be equally readily stripped, a number of exceptions were found amongst other classes of colours.

IN a recent issue of "Naturwissenschaften," 1933, p. 252, Schwartz describes a new process of china clay manufacture which involves autoclave treatment of feldspar in presence of dilute hydrochloric or sulphuric acid. The material is treated for 250 hours at 300° C. Leucite is also amenable to the same treatment. The discovery suggests the interesting theory that china clay deposits in nature may in some cases have resulted from the action of superheated mineral acid solution upon alkali-aluminium silicates.

Society of Chemical Industry

Annual Meeting of the Manchester Section

THE annual meeting of the Manchester Section of the Society of Chemical Industry was held at the Engineers' Club, Manchester, on April 7, Dr. T. Callan being in the chair. The officers and committee elected were:—Chairman, Dr. A. Schedler; vice-chairman, Dr. T. Callan; hon. secretary and treasurer, Mr. A. McCulloch; hon. assistant secretary, Mr. H. Shaw; committee, Dr. W. H. Brindley, Dr. A. Coulthard, Mr. T. Horner, Mr. D. M. Paul, Miss Rona Robinson, Mr. F. Scholefield, and Mr. C. M. Whittaker, who together with Mr. R. Brightman, Dr. A. Geake, Mr. R. O. Jones, Dr. E. H. Rodd, Dr. F. C. Wood, and Mr. H. Cheetham as Chemical Engineering Group representative, constitute the new committee.

The ordinary meeting, which followed the annual meeting, was somewhat novel in character in that it was devoted to a consideration of various aspects of the textile industry, the following papers being presented:—"The Detection of Oxy- and Hydro-Cellulose," by Dr. H. A. Thomas; "The Influence of Vat Dyes on the Light Tendering of Cellulose," by Mr. C. M. Whittaker; "Some Observations on the Quantitative Description of the Dyeing Properties of Direct Cotton Colours," by Mr. S. M. Neale; "The Glass Electrode and its Use for the Measurement of the *pH* of Hypochlorite Bleach Liquors," by Mr. G. F. Davidson; and "The Analysis of Mixtures of Cotton and Rayon," by Dr. B. P. Ridge and Dr. K. Turner.

Birmingham and Midland Section

The 27th annual meeting of the Birmingham and Midland Section of the Society of Chemical Industry was held at the University of Birmingham on April 6. Mr. H. W. Rowell was re-elected chairman; Mr. W. T. Collis hon. treasurer; Mr. J. R. Johnson, hon. auditor; and Mr. G. King, hon. secretary. Mr. W. A. S. Calder, Professor Hopkins and Messrs. J. R. Johnson, J. E. Such and J. Wilson were elected to vacancies on the committee.

The report, read by Mr. George King, stated that during the year Mr. Rowell, supported by the committee, placed before the Council of the Society a definite scheme for re-organisation which might have far reaching results. Mr. King stated that the programme for next season would include a joint meeting with the Chemical Engineering Group and contributions of interest to the Food and Plastic Groups.

The CHAIRMAN stated that during the past few months the Society of Chemical Industry, the Chemical Society and the Institute of Chemistry had had under consideration the question of forming a consolidating society with the primary object of eliminating duplication of publications and eventually, it was hoped, of having one journal for chemistry. Professor Pope's committee had reported to the three societies and approval in principle to their report had been given by the Society of Chemical Industry and the Chemical Society. The decision of the Institute was awaited with interest.

Malodorous Gases

Removal in Manufacture of Alkali Cellulose

A METHOD has recently been patented in Sweden for removing the malodorous substances, such as hydrogen sulphide and mercaptans, from the waste gases in the manufacture of sulphate and alkali cellulose. The gases are cooled or saturated with water until the dew point is reached, and are then treated with an alkaline aqueous solution or emulsion of hydrocarbons of the terpene or camphor group or addition compounds, or derivatives of such hydrocarbons. The treatment is carried out under reduced gas velocity (0.5 per. sec. or less) and can take place under reduced, atmospheric, or slightly increased pressure. Before the absorption treatment the gases liberated by the boiling and gasing, etc., of the cellulose digesters are purified by absorption in alkaline liquids, and are then conducted to the alkali-recovery plant, where they are burned and collected with the other smoke gases from the smelting furnaces, soda furnaces, etc.; then the total gas mixture is subjected to the treatment described for removing the residual content of hydrogen sulphide, mercaptans, and other ill-smelling substances.

German Dye Trust

Dividend Maintained

THE German Dye Trust (I. G. Farbenindustrie A.G.) at their board meeting, on April 7, decided to propose to the general meeting of shareholders on April 28 the distribution of a 7 per cent. dividend for the financial year 1932, the same as for the year 1931, after a 12 per cent. dividend had been paid for several preceding years. Details of the financial results and the annual report of the year 1932 are to be published within the next few days. The company has increased its holdings in its own shares, which were shown at the close of 1931 at 4,347,800 marks, by occasional purchases in order to avoid losses of outstanding claims against customers in an amount of 5,000,000 marks, whereby the share capital entitled to the dividend has been reduced to 680,000,000 marks.

According to "L'Agence Economique," the board detects signs of improvement in the business position during the first quarter of 1933. This applies mainly to the home business; export business is suffering from the American crisis and from exchange and trade restrictions. Sales of dyes are slightly below the level of the corresponding period of 1932, but the chemical products have maintained the level of last year. The sales of nitrogenous fertilisers continue to improve, stocks are down and output slightly increased. This is mainly due to favourable weather conditions in March. Petrol production at Leuna has been maintained at the same level. Pharmaceutical products have sold well in Germany and in parts of Europe, but have suffered in the Far East and overseas countries. Photographic products have suffered a diminution in export markets, which is not quite made up by an improvement in Germany. While the sales of viscose silk are down, those of acetate have risen.

United Molasses Co., Ltd.

Shrinkage of International Business

IN respect of the year 1932 the directors of the United Molasses Co. report a total loss of £1,126,600, inclusive of £299,565 capital losses incurred during the year. The total debit carried forward at December 31 last was £1,902,283. In regard to general trading conditions, it is stated that the renewed fall in the consumption of molasses in all the main consuming markets, which made itself felt about the middle of last summer, still continues. The decline has been specially severe in the United States, where the consumption in 1932 fell to approximately 50 per cent. of the 1931 figure. In Europe—mainly on the Continent—the falling off in the demand during the past six months amounts to about 25 per cent. In India the import of molasses has practically come to an end, in consequence of the new Indian sugar tariff.

This general falling-off in the consumption of molasses, caused by the world-wide depression, coupled with the tariff policy of many of the large consuming countries and other developments, have brought about such radical changes in the world's molasses requirements that a large part of the business for which the company was equipped to cater, has, for the moment, ceased to exist. The volume of the international business in molasses has shrunk to less than one-third of the average of the three years from 1927 to 1929.

Fashion Shades for Autumn, 1933

A NEW folder issued by The Geigy Colour Co., Ltd., gives ten shades which have been specially selected in order to give the many branches of the dyeing industry some guide to the probable shades for Autumn, 1933. This colour card should prove a useful guide to wool, cotton, viscose, garment or union dyes. The patterns which are shown dyed on woollen flannel, are produced with fast-to-light, level dyeing acid colours. Other recipes producing similar shades are given including diphenyl fast colours suitable for high class cotton goods where good fastness to light is essential; direct colours for the cheaper cotton material, largely used for certain classes of trade, where moderate fastness meets the requirement; colours suitable for viscose, which show excellent level dyeing properties, together with good all-round fastness; and union colours which produce solid shades on wool and cotton material dyed in one bath.

Works Equipment News

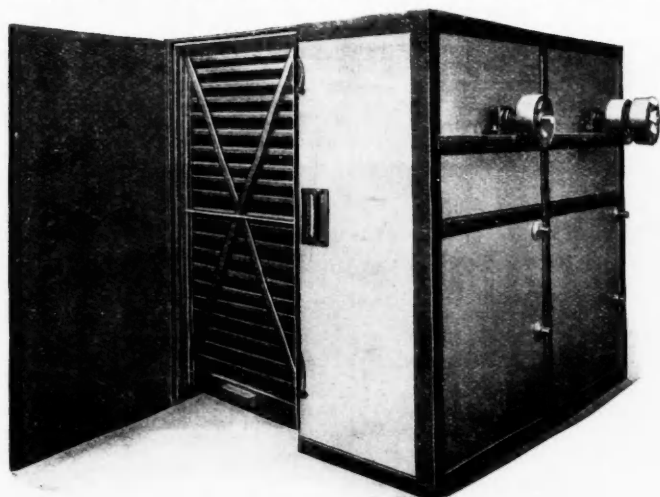
Modern Aids for the Chemical and Allied Trades

ONE of the most backward operations in the chemical and allied industries to-day is the drying of material to prepare them for treatment, or as the finishing operation prior to packing and shipment. In the fine chemical, dyestuffs, food-stuffs, and colour industries, practically all drying has to be carried out at relatively low temperatures, and in most cases, steam is the medium used for heating the drying air. The consumption of steam per pound of water evaporated will vary considerably with the type of dryer, and whereas the steam consumed on an efficient modern drying stove will be in the neighbourhood of 2 lb. per 1 lb. of water evaporated, on some of the primitive dryers in use, the steam consumption may be double this quantity.

Drying has always been considered as a necessary evil and little attention has been paid to its economics. Dryers are usually home-made, stuck away in an odd corner—usually unfit for any other plant to occupy—and unless a steam engineer is particularly keen, the steam is used as recklessly as it were of little value. A works drying a ton of

dispensed with. The instrument operates on the thermocouple or electric resistance principles, and is suitable for temperatures up to 2,500° F. The galvanometer is of the moving coil type, spring controlled, and double pivoted with spring jewelled bearings. In the thermocouple instrument it is fitted with automatic "cold end" compensation consisting of a bimetallic strip attached to the hair spring. The movement is totally enclosed in a separate box inside the main case, scale and indicating pointer being viewed through a glass window. The galvanometer case is mounted on shock absorbers ensuring clear records under conditions of vibration. The automatic mechanism is fitted with mercury tube switches to avoid trouble due to faulty contacts. A numbered indicator with colour corresponding to the record, shows through the window below the lock with which the temperature point is in contact.

The instrument is operated by the mercury tube switch which connects the galvanometer to one of the temperature points. The galvanometer pointer swings over the scale and



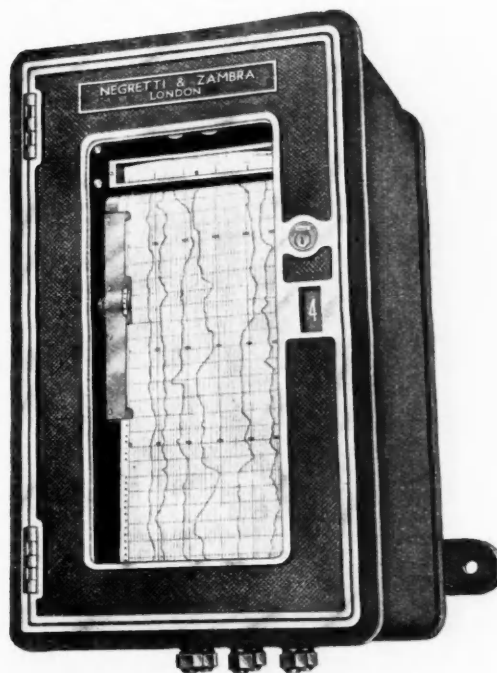
The Mitchell Compartment Stove.

material per day, containing 50 per cent. water on the wet weight, in an efficient modern stove using live steam for heating the drying air, would require approximately 700 tons of steam per annum. With a steam cost of 2s. per 1,000 lb., the value of the steam alone is £156, and on a less efficient dryer the cost can easily reach £300. In addition to the economies that can be effected on steam consumption with modern stove, considerable saving can be made on floor space, labour and drying time.

As each material to be dried requires specified conditions of drying, the dryer must be capable of producing these conditions unalterably: temperature, humidity, speed of air circulation, time, etc., must all be capable of fine adjustment, so that the material produced is at its best. The "Mitchell" drying stove, shown in the accompanying illustration, has been scientifically designed to meet the most exacting requirements of the drying engineer and chemist, and is particularly suitable for diffusing large quantities of low pressure air over the material to be dried.

A Multipoint Recording Pyrometer

PARTICULARS have been received concerning a new multipoint recording pyrometer, manufactured by Negretti and Zambra. This pyrometer gives a bold and clear record of the temperature from a number of points in distinctive coloured traces on a continuous chart, and has been designed to operate for long periods under the severest industrial conditions with a minimum of attention. The chart lasts fifty days, the inking ribbon lasts for a year or more, and with the synchronous motor model, all winding of the clock is



Negretti and Zambra Multipoint Recording Pyrometer

chart and takes up the position according to the temperature of the point in circuit. The renewal of the chart roll is a simple procedure. The chart plate falls forward when a spring clip is released and the side plates hinge back allowing the perforations in the chart to be engaged with pins on the driving wheels; the side plates are then closed, holding the chart in position, and the chart plate returned to the original position held by the spring clips.

A Choice of Thermostats

A BOOKLET has been issued by The Rheostat Co., Ltd., detailing various types of thermostats and explaining the technical points of these instruments. Sixteen different types of thermostats are illustrated. One type is designed for controlling room temperatures whenever the controlling medium is by an electric circuit. Owing to its large current capacity it is particularly suitable for control of electrically heated rooms and buildings, but it will give equally efficient control with oil-fired, hot water or steam heating installations, steam unit heaters and other forms of space heating. Other types are designed for the control of liquid temperatures through the medium of an electric circuit.

While their chief applications lie in the temperature control of electric water heaters, calorifiers, oil pre-heaters, and for boiler control for oil burner installations, they are suitable for all purposes where really consistent and reliable control of liquids is required. There is also a flame thermostat constructed for use on semi-automatic and high-low oil burning installations, or on any installation in which the size of flame may be adjusted automatically or manually to meet heating requirements. The last feature in the catalogue is an electrically operated valve. The chief advantages of this valve are that owing to the high torque development by the pulling motor, positive operation is ensured under all circumstances, independent of frictional resistance of the butterfly-spindle, whilst owing to the movement of the valve being slow and definite, any possibility of water hammer during operation is avoided.

Temperature and Humidity Recording

THE accompanying illustration shows a combined temperature and humidity recorder which has been introduced by the Cambridge Instrument Co., Ltd. It has been designed to provide simultaneous records of both temperature and



The Cambridge Combined Temperature and Humidity Recorder

humidity on the one chart, and is particularly valuable for use in connection with the manufacture and storage of textiles, paper, tobacco and other products which may require definite atmospheric conditions for effective working or preservation. The instrument is provided with two independent pens moving over a chart calibrated in temperature degrees and also in terms of relative humidity. The temperature recording mechanism is of the mercury-in-steel type, and has the sensitive bulb fitted immediately below the instrument case; this bulb is provided with radiator fins which greatly increase the exposed area and render the instrument quickly responsive to small changes in temperature.

In order to record the humidity, advantage is taken of a property of goldbeater's skin, which varies in length with the hygrometric state of the surrounding atmosphere; it has been demonstrated that these variations in length are accurately repeatable if the skin is maintained under definite conditions of tension. In the actual instrument, two strips of goldbeater's skin are stretched side by side within a perforated cylinder projecting downwards from the base of the recorder. The lower end of each skin is rigidly attached to the bottom of a frame inside the cylinder, while the upper end is fixed to a link mechanism within the instrument case; this link mechanism is in turn connected to the humidity-recording pen. Any small variations in the length of the goldbeater's skin are, therefore, communicated to the pen, and are recorded on the chart as a percentage relative humidity. The standard instrument has a humidity range of 30 to 100 per cent. saturation, the system not being suitable for humidity conditions below 30 per cent.

A New Type of Burner

A NEW type of Bornkessel burner, which has an improved all-metal jet instead of the formerly used glass jet, has been introduced by Chance Brothers and Co., Ltd. This improvement enables the jets to be more easily adjusted and also eliminates the risk of breakage. The principle upon which the burner operates is that of a multiplicity of jets, each of perfect shape, built to any contour desired. All jets are controlled from one point, so that each flame maintains the same length and intensity without individual adjustment. Bornkessel burners are of use to the chemical industry in



The Bornkessel Burner, Showing Constant Length and Intensity of Flames

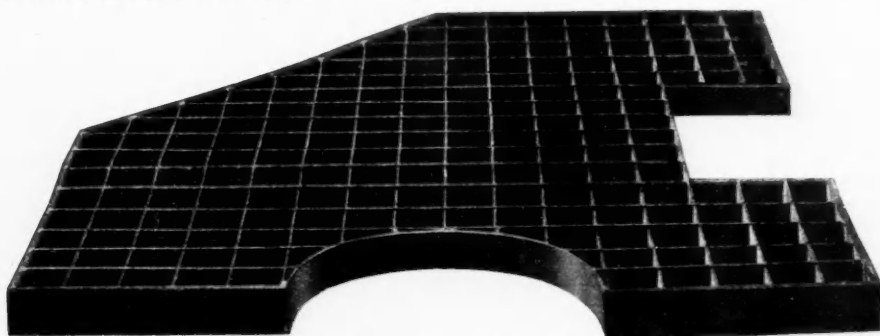
that they can be employed in the manipulation of all kinds of glass tubing. Owing to their very accurate flame control, together with the high temperatures due to the thorough mixing of the gas and air, the burners are also applicable to all operations where localised or accurate heat control is required. Arrangements have been made whereby these burners are being manufactured at Smethwick, Birmingham, under licence from Bornkessel Brenner und Glasmachinen G.m.b.H., Berlin; they are therefore entirely British produced, and the same high quality, workmanship and accuracy of manufacture will be maintained.

Open Steel Flooring

FOR many years it has been recognised that an open steel floor, which permitted the passage of light and air, has many advantages in power houses and industrial works. To meet these requirements Babcock and Wilcox, Ltd., have introduced a patent interlock open steel flooring, which combines maximum strength with minimum weight, whilst no single member will fail by overturning, twisting or buckling before the strength of the material is developed. This interlock flooring can be cut more easily than solid plate, and is the

only flooring manufactured with a complete surround which enables it to fit round pipes, columns and similar obstructions without impairing the strength of the panel. Due to the interlock construction there is strength in each direction of the panel; it is also very easily fitted round machine bases or into irregular spaces. In addition it forms an efficient non-slip traction surface, and truck wheels, power tractors,

of a type which can be switched direct to the mains; in the automatic units the switching is effected by means of a float-operated switch. Capacities range from 1,500 gal. per hour (with a total head of 25 feet) to 200 gal. per hour (with a total head of 45 feet). In use the unit is installed in a sump so that the motor cannot be flooded in case of a failure of the electric supply.



The Babcock and Wilcox Interlock Open Steel Flooring.

trailers, and rib-hooped barrels, etc., may pass over it as easily as over solid surfaces. It is manufactured in panels, and can be easily handled and installed by two men; no drilling or tapping is required as each panel is securely bolted to its neighbour. Another advantage is that it can be very easily removed and re-arranged in new positions as plant extensions or re-adjustments may require. It also has a minimum dead weight and effects a material saving in the total weight of a flooring, together with an appreciable saving in the cost of the supporting structure, while, as a result of its trussed construction, there is a distribution of concentrated loads over a wide area.

A Pump for Seepage and Cooling Water

FOR removing seepage and leakage water in buildings below sewer level, to prevent flooding in the case of burst pipes, and for dealing with the accumulation of cooling water in various types of plant, Rhodes, Brydon and Youatt, Ltd., have now introduced vertical "Mopump" units of



Vertical "Mopump" Units: Left, Non-automatic unit Above, Automatic unit.

the non-automatic and automatic types. These new pumps are constructed with all the care and accuracy of the larger standard Mopumps. All parts are of special gunmetal, the impeller being heavily coated with chromium to resist corrosion and wear, whilst the driving spindle is of stainless steel. Suction is effected through the base, where a perforated plate stops the entry of any matter large enough to affect the working of the pump. In all cases the motors are

Totally Enclosed Electric Motors

THE difficulties hitherto associated with totally-enclosed motors, except in quite small sizes, have been overcome by the introduction of special frame-cooled totally-enclosed A.C. "Witton" motors. Previously, a totally-enclosed motor to give more than small quantities of power had to be of excessive dimensions, because of the need for a large heat radiating surface, but the "Witton" frame-cooled motor is of normal dimensions due to its special ventilating features. The machine is designed on standard lines, apart from the variations due to the method of ventilation. The shell, however, consists of a double wall casting, the annular space between the walls being divided into sections by longitudinal ribs to form ventilating ducts, which are arranged to give two separate circuits for internal and external air flow, adjacent ducts being in different circuits. Air is blown round the internal circuit by a fan at the driving end whilst a second fan forces a continual flow of cool air through the adjacent external ducts. In this way the heat is transferred from the totally-enclosed part of the motor to the external ducts and



Totally-enclosed "Witton" Slip Ring Motor.

carried away. By the use of this double circuit ventilation, all parts of the motor are adequately cooled and there is no possibility of air remaining stationary in any part of the machine forming hot pockets. The fans are fitted on the rotor in such a way as to leave both bearings accessible from the outside, making for simple dismantling and re-assembly. The exhaust openings for the external air are arranged with a clear opening and the external ducts can therefore be cleaned out with a flue brush when necessary, without disturbing any part of the motor.

News from the Allied Industries

Iron and Steel

THE IRON AND STEEL REORGANISATION scheme and correspondence between the National Committee for the Iron and Steel Industry and the Import Duties Advisory Committee, has been published by H.M. Stationery Office, price 3d. net.

Glass

THE BRITISH GLASS INDUSTRY is holding its third convention at Buxton, May 18-20. Sir Max Bonn will preside, and there will be addresses and discussions on such questions as co-operation in industry, hours of work, recent technical developments in the glass industry, education and research. At the official luncheon at the Palace Hotel, Buxton, on May 18, the chief guest will be Mr. J. H. Thomas, Secretary of State for the Dominions. A brochure giving full details of the programme can be obtained from the honorary secretary of the convention, Mr. Geoffrey Marchand, Glass Manufacturers' Federation, 13 Southampton Street, High Holborn, London, W.C.1.

Artificial Silk

AN INTERESTING STATEMENT was made by Mr. C. T. Pott at the meeting of the British Enka Artificial Silk Co. on April 7, in regard to a possible change of control. It was mentioned that the British Enka's parent company and Courtaulds had been in negotiation for some time past with a view to finding means to rearrange some of their interests and come to a workable agreement in connection with European, Far Eastern, and certain other markets. If this agreement were achieved, added Mr. Pott, it must involve a transfer of control of the British Enka to Courtaulds. According to the profit and loss account, the company made a working profit of £30,462, which did not quite suffice to meet general charges, after making the reserve for unrealised loss on exchange. After making provision for depreciation of buildings, plant and machinery, a net loss for the year of £85,502 is shown as compared with a net loss last year of £78,278.

Cement

IT IS PROPOSED TO INCREASE the capital of the Central Portland Cement Co. to £275,000 by the creation of 125,000 6 per cent. cumulative redeemable preference shares of £1 each. The directors intend to offer 100,000 of these shares to shareholders in proportion to their holdings, while the outstanding 50,000 4s. ordinary shares are also to be issued. On August 2 next the £137,226 of 5½ per cent. mortgage debenture stock is to be redeemed at 102½ per cent., and the company will apply part of its cash and liquid assets towards the redemption, the balance being provided out of the proceeds of the share issues noted above. It is worth noting that the company will have the right to repay the new preference shares at 22s. per share at any time after April 1, 1953, on three months' notice. In respect of the year ended September last the company made a profit of £27,307 and increased the dividend on its ordinary share capital from 7½ to 10 per cent.

Coal Distillation

THE COAL DISTILLATION PLANT near Leacroft Colliery, Cannock, and the plant on the Thames at Belvedere, have now come under the same control, and both are to be adapted to the treatment of colloidal fuel, the prime object being to secure motor spirit from coal. The plant at Cannock has already been reconditioned, and the one at Belvedere will be brought into operation at the earliest possible moment. The methods under which both these plants will work constitute an entirely new development in the treatment of coal. In order that the process may be entirely self-contained a spirit recovery plant is now in course of construction. The object is to secure the maximum quantity of motor spirit from the distillate obtained under the Cannock process. No other by-products will be manufactured, the residual oil (after the motor spirit has been recovered) being used for the further preparation of colloidal fuel. The Cannock plant will be running in a few weeks with a capacity of 100 tons per day, and the plant at Belvedere will be running in three months' time with a capacity of 300 tons per day.

Rubber

A RESTRICTION SCHEME, drawn up by a prominent Amsterdam rubber broker, and put forward by the president of the International Society of Rubber Culture of the Dutch East Indies, proposes a ten-years' convention between rubber growers in all countries to establish a quota for each country. It is further proposed not to allow an extension of rubber growing during the period of the convention.

Mineral Oil

THE INTERNATIONAL OIL CONFERENCE, which has been sitting in Paris for a week, was brought to a close on April 8. In an official communiqué it is stated that the conference of international groups and the Roumanian group has finished its work. The aim of the agreements which have been reached is to stabilise the industry, thus following the work which was undertaken in Washington with the same object. It is added that another conference will take place in June to study the conditions at that time and to decide on the measures which may be necessary to maintain the stability of the industry. In well-informed quarters it is believed that the Roumanian producers have been allowed a quota of 18,500 tons per day, which they will be permitted to sell in any market without restriction. By the time the next conference is held it should be possible to get a clearer view of the position in America.

Nor-Rust Liquid Lead Co., Ltd.

Petition Dismissed

IN the Companies Court on Monday, Mr. Justice Maugham had before him a petition by Transport (1910), Ltd., of Tothill Street, Westminster, for the compulsory winding-up of Nor-Rust Liquid Lead Co., Ltd.

Counsel said this was a judgment creditors petition. Since the petition was last before the Court, terms had been agreed. Although the terms had been agreed counsel could not see eye to eye with counsel with regard to the costs. The first term of the settlement was the payment, in cash, of 6s. 8d. in the £ on the debt and costs. The petitioner had received the third of the debt and costs and he asked for the balance by certain instalments.

His lordship: I cannot do that. This petition ought not to be used for the purpose of debt collecting. I shall dismiss the petition without costs.

New Dyestuff Licences

Applications in March

THE following statement relating to applications for licences under the Dyestuffs (Import Regulation) Act, 1920, made during March, has been furnished to the Board of Trade by the Dyestuffs Advisory Licensing Committee. The total number of applications received during the month was 650, of which 580 were from merchants or importers. To these should be added three cases outstanding on February 28, making a total for the month of 653. These were dealt with as follows:—Granted, 631 (of which 628 were dealt with within seven days of receipt); referred to British makers of similar products, twelve (of which ten were dealt with within seven days of receipt); outstanding on March 31, ten. Of the total of 653 applications received, 638 or 98 per cent. were dealt with within seven days of receipt.

Lithuanian Paint and Varnish Industry

ALL grades of paint products are produced in Lithuania, and there are six establishments engaged in the industry producing the total estimated annual value of £10,000. Domestic production, however, is insufficient to meet consumption and considerable quantities of various grades of paints are imported annually. Germany is the main source of supply, while Latvia, Sweden, France, and Soviet Russia are also represented in the market.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THE following market report is based on information supplied by the British manufacturers concerned, and unless otherwise qualified the figures quoted apply to fair quantities, net and naked at makers' works. Where no locality is indicated, the prices are general for the United Kingdom. Particulars of the London chemical market are specially supplied to THE CHEMICAL AGE by R. W. Greeff and Co., Ltd., and Chas. Page and Co., Ltd., and those of the Scottish chemical market by Chas. Tennant and Co., Ltd.

THE London market does not report any appreciable change, prices continuing firm. Rather quiet conditions have been experienced on the Manchester market, movement of the majority of products being on a smaller scale than in the previous week or two. This is due in no small extent to the influence of the Easter holiday break. The majority of consuming works will only be closed for three or four days, but here and there the average stoppage will be longer. In the meantime, the general price tendency is steady, and actual fluctuations since last report have been limited both in number and extent. Steady buying has to be reported in the Scottish heavy chemical market. Prices generally remain unchanged.

General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s.; tech., 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98 100%, £48 to £52; pure 80%, £39 5s.; tech., 80%, £38 5s. d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—SCOTLAND: Granulated commercial, £26 10s. per ton; B.P. crystals, £35 10s.; B.P. powder, £36 10s. in 1-cwt. bags d/d free Great Britain in 1-ton lots upwards.

ACID, CHROMIC.—11d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—LONDON: 10d. per lb.; less 5%, MANCHESTER: 9½d.

ACID, CRESYLIC.—97 99% 1s. 3d. to 1s. 7d. per gal.; 99/100%, 1s. 7d. to 2s.

ACID, FORMIC.—LONDON: £52 per ton.

ACID, HYDROCHLORIC.—Spot, 3s. 9d. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £45; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £20 per ton makers' works, according to district and quality. SCOTLAND: 80°, £23 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 7s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98 100%, £49 to £52 ex store. MANCHESTER: £48 ex store.

ACID, SULPHURIC.—Average prices f.o.r. British makers' works, with slight variations owing to local considerations: 140° Tw. crude acid, £3 per ton; 168° Tw. arsenical £5 10s.; 168° Tw. non-arsenical, £6 15s. SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—10½d. per lb. SCOTLAND: B.P. crystals, 10½d., carriage paid. MANCHESTER: 10½d.

ALUM.—SCOTLAND: Lump potash, £9 per ton ex store.

ALUMINA SULPHATE.—LONDON: £8 5s. to £9 10s. per ton. SCOTLAND: £8 to £8 10s. ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICARBONATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £32 per ton; powdered, £34, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—£37 to £45 per ton, carriage paid. LONDON: Fine white crystals, £19 to £20. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £24 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden 6½d. to 1s. 1½d. per lb.; crimson, 1s. 3d. to 1s. 5d. per lb., according to quality.

ARSENIC.—LONDON: £22 14s. c.i.f. main U.K. ports for imported material; Cornish nominal, £23 f.o.r. mines. SCOTLAND: White powdered, £25 ex wharf. MANCHESTER: White powdered Cornish, £23 10s. at mines.

ARSENIC SULPHIDE.—Yellow, 1s. 6d. to 1s. 8d. per lb.

BARIUM CHLORIDE.—£11 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London, packages free.

BLEACHING POWDER.—Spot 35/37%, £7 19s. per ton d/d station in

casks, special terms for contract. SCOTLAND: £8 15s. in 5/6 cwt. casks.

BORAX, COMMERCIAL.—Granulated, £15 10s. per ton; powder, £17 packed in 1-cwt. bags, carriage paid any station Great Britain. Prices are for 1-ton lots and upwards.

CADMIUM SULPHIDE.—3s. 1d. to 3s. 5d. per lb.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. to £5 15s. per ton d/d station in drums.

CARBON BISULPHIDE.—£30 to £32 per ton, drums extra.

CARBON BLACK.—3½d. to 5½d. per lb., ex wharf.

CARBON TETRACHLORIDE.—£41 to £46 per ton, drums extra.

CHROMIUM OXIDE.—10d. to 10½d. per lb., according to quantity d/d U.K. Green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3½d. per lb. Liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—LONDON: £4 5s. per cwt.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £28 per ton. SCOTLAND: 40%, £28 ex store.

LAMPBLACK.—£46 to £50 per ton.

LEAD ACETATE.—LONDON: White, £34 per ton; brown, £1 per ton less. SCOTLAND: White crystals, £34 to £36; brown, £1 per ton less. MANCHESTER: White, £32 10s.; brown, £30.

LEAD NITRATE.—£28 per ton.

LEAD, RED.—SCOTLAND: £28 10s. per ton d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £40 per ton, carriage paid.

LITHOPONE.—30%, £17 10s. to £18 per ton.

MAGNESITE.—SCOTLAND: Ground Calcined £9 per ton ex store.

METHYLATED SPIRIT.—61 O.P. Industrial 1s. 8d. to 2s. 3d. per gal. Pyridinised Industrial, 1s. 10d. to 2s. 5d. Mineralised, 2s. 9d. to 3s. 3d. 64 O.P. 1d. extra in all cases. Prices according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£52 per ton d/d.

NICKEL SULPHATE.—£52 per ton d/d.

PHENOL.—9d. to 10d. per lb. nominal.

POTASH, CAUSTIC.—LONDON: £42. MANCHESTER: £41.

POTASSIUM BICROMATE.—Crystals and Granular, 5d. per lb. net d/d U.K. Discount according to quantity. Ground 5½d.

POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.

POTASSIUM NITRATE.—SCOTLAND: Refined Granulated £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 8½d. per lb. SCOTLAND: B.P. crystals, 9d. MANCHESTER: Commercial, 8½d. B.P., 8½d.

POTASSIUM PRUSSIAN.—LONDON: 8½d. to 9d. per lb. SCOTLAND: Yellow spot material, 8½d. ex store. MANCHESTER: Yellow, 8½d.

SALAMMONIAC.—First lump spot, £42 17s. 6d. per ton d/d in barrels.

SODA ASH.—58% spot, £6 per ton f.o.r. in bags, special terms for contracts.

SODA, CAUSTIC.—Solid 76 77° spot, £14 10s. per ton d/d station. SCOTLAND: Powdered 98 99%, £17 10s. in drums, £18 15s. in casks, Solid 76 77°, £14 10s. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 10s. contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£22 per ton. LONDON: £23 to £24.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 10s. ex quay or station. MANCHESTER: £10 10s.

SODIUM BICROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON: 4d. per lb. with discounts for quantities.

SCOTLAND: 4d. delivered buyer's premises with concession for contracts. MANCHESTER: 4d. less 1 to 3½% contracts, 4d. spot lots.

SODIUM BISULPHITE POWDER.—60/62%, £16 10s. per ton d/d 1-cwt. iron drums for home trade.

SODIUM CARBONATE (SODA CRYSTALS).—SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—£32 per ton.

SODIUM CHROMATE.—3½d. per lb. d/d U.K.
SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £15 ex station, 4-ton lots. MANCHESTER: Commercial, £9 5s.; photographic, £15.
SODIUM NITRITE.—Spot, £19 to £22 per ton d/d station in drums.
SODIUM PERBORATE.—LONDON: 10d. per lb.
SODIUM PHOSPHATE.—£12 10s. per ton.
SODIUM PRUSSIAN.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5½d. ex store. MANCHESTER: 4½d. to 5½d.
SODIUM SILICATE.—140° Tw. Spot £8 5s. per ton d/d station, returnable drums.
SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d. SCOTLAND: English material £3 15s.
SODIUM SULPHATE (SALT CAKE).—Unground Spot, £3 15s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 2s. 6d.
SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 2s. 6d. d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8.
SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £9 10s. d/d station in bags.
SULPHATE OF COPPER.—MANCHESTER: £15 per ton f.o.b.
SULPHUR.—£11 15s. per ton. SCOTLAND: Flowers, £11; roll, £10 10s.; rock, £9; ground American, £10 ex store.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.
SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.
VERMILION.—Pale or deep, 4s. 5d. to 4s. 9d. per lb.
ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.
ZINC SULPHATE.—LONDON AND SCOTLAND: £12 per ton.
ZINC SULPHIDE.—1s. to 1s. 1d. per lb.

Intermediates and Dyes

In the following list of intermediates delivered prices include packages except where otherwise stated:—

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.
ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.
ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.
ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100% d/d buyer's works.
ACID, SULPHANILIC.—Spot, 8d. per lb. 100% d/d buyer's works.
ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.
BENZIDINE BASE.—Spot, 2s. 5d. per lb. 100% d/d buyer's works.
p-CRESOL 34.5° C.—1s. 9d. per lb. in ton lots.
m-CRESOL 98/100%.—2s. 3d. per lb. in ton lots.
p-CRESOL 34.5° C.—1s. 9d. per lb. in ton lots.
DICHLORANILINE.—2s. 3d. per lb.
DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.
DINITROBENZENE.—8d. per lb.
DINITROTOLUENE.—48/50° C., 8d. per lb.; 66/68° C. 8½d. per lb.
DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.
α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.
β-NAPHTHOL.—Spot, £78 15s. per ton in paper bags; £79 15s. in casks, in 1-ton lots.
β-NAPHTHYLAMINE.—Spot, 11½d. per lb., d/d buyer's works.
β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb. d/d buyer's works.
o-NITRANILINE.—5s. 10d. per lb.
m-NITRANILINE.—Spot, 2s. 7d. per lb. d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 8d. per lb. d/d buyer's works.
NITROBENZENE.—Spot, 4½d. per lb.; 5-cwt. lots, drums extra.
NITRONAPHTHALENE.—9d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.
o-TOLUIDINE.—Spot, 9½d. per lb., drums extra, d/d buyer's works.
p-TOLUIDINE.—Spot, 1s. 11d. per lb., d/d buyer's works.
m-XYLIDINE ACETATE.—3s. 4d. per lb.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 9d. to 11d. per lb.; crude, 60's, 1s. 11d. to 2s. per gal.; 2½% water, 3s. 0½d. MANCHESTER: Crystals, 9½d. per lb.; crude, 2s. 5d. per gal. SCOTLAND: 60's, 1s. 7d. to 1s. 8d.
ACID, CRESYLIC.—99/100%, 11d. to 1s. 8d. per gal.; pale 95%, 11d. to 11½d.; dark, 10d., all according to specification; refined, 1s. 7d. to 1s. 8d. LONDON: 98/100%, 1s. 3d.; dark, 95/97%, 11d. SCOTLAND: Pale 99/100%, 1s. 3d. to 1s. 4d.; 97/99%, 1s. to 1s. 1d.; dark 97/99%, 11d. to 1s.; high boiling acid, 2s. 6d. to 3s.
ANTHRACENE OIL.—Strained, 4½d. per gal.

BENZOL.—At works, crude, 10d. to 11d. per gal.; standard motor, 1s. 6½d. to 1s. 7d.; 90%, 1s. 7d. to 1s. 8d.; pure, 1s. 10d. to 1s. 11d. LONDON: Motor, 1s. 7½d. SCOTLAND: Motor, 1s. 6½d. to 1s. 7½d.; 90%, 2s. 0½d. to 2s. 1½d.
CREOSOTE.—Standard for export, 4½d. to 5d. net per gal. f.o.r. for Home, 3½d. d/d. LONDON: 3d. to 3½d. f.o.r. North; 4d. to 4½d. London. MANCHESTER: 2½d. to 3½d. SCOTLAND: Specification oils, 3½d. to 4½d.; washed oil, 4d. to 4½d.; light, 3½d. to 4½d.; heavy, 4½d. to 5d.
NAPHTHA.—Solvent 90/160%, 9d. to 1s. 2d. per gal.; 95/160%, 1s. 7d. to 1s. 8d.; 90/160%, 1s. 1d. to 1s. 2d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.
NAPHTHALENE.—Crude, Hot-Pressed, £6 1s. 3d. per ton. Flaker, £10 per ton. Purified crystals, £9 10s. per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 65s. to 70s.
PITCH.—Medium soft, £4 10s. per ton. MANCHESTER: £4 to £4 5s. f.o.b. LONDON: £4 5s. to £4 10s. f.o.b. East Coast port.
PYRIDINE.—90/140, 3s. 9d. per gal.; 90/160, 4s. to 4s. 6d.; 90/180, 2s. to 2s. 6d. SCOTLAND: 90/160% 4s. to 5s.; 90/220%, 3s. to 4s.

Wood Distillation Products

ACETATE OF LIME.—Brown, £8 10s. to £8 15s. per ton. Grey £13 to £14. Liquor, brown, 30° Tw., 6d. per gal. MANCHESTER: Brown, £9 10s.; grey, £13.
ACETIC ACID, TECHNICAL, 40%.—£17 to £18 per ton.
AMYL ACETATE, TECHNICAL.—95s. to 110s. per cwt.
CHARCOAL.—£6 to £11 per ton.
WOOD CREOSOTE.—6d. to 2s. per gal., unrefined.
WOOD NAPHTHA, MISCIBLE.—2s. 7d. to 4s. per gal. Solvent, 3s. 9d. to 4s. 9d. per gal.
WOOD TAR.—£2 to £6 per ton.
REFINED COAL TAR.—SCOTLAND: 4½d. to 5d. per gal.
XYLOL.—Common, 1s. 11d. to 2s. per gal.; pure, 2s. to 2s. 2d.
TOLUOL.—90%, 1s. 11d. to 2s. per gal.; pure, 2s. 3d.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Export, £6 per ton f.o.b. U.K. ports in single bags; home, £6 10s. per ton, delivered in 6-ton lots to consumer's nearest station.
NITRATE OF SODA.—£8 16s. per ton, delivered in 6-ton lots to consumer's nearest station.
CYANAMIDE.—£7 per ton, delivered in 6-ton lots to consumer's nearest station.
NITRO-CHALK.—£7 5s. per ton, delivered in 6-ton lots to consumer's nearest station.
CONCENTRATED COMPLETE FERTILISERS.—£10 9s. 6d. to £11 per ton according to percentage of constituents as follows:—

PERCENTAGE OF CONSTITUENTS.

	Nitrogen.	Phosphoric Water Soluble.	Acid. Insol.	Potash.	Price per Ton.
No. 1	12.5	12.5	—	15.0	10 14 0
No. 2	10.4	10.4	—	20.8	10 16 0
No. 4	10.4	20.8	—	10.4	10 12 6
No. 5	8.0	16.0	5.5	16.0	10 9 6
No. 6	7.5	26.0	6.0	7.5	11 0 0
No. 7	6.5	22.5	3.0	13.0	10 12 6

The above prices are for delivery to farmer's nearest station in 6-ton lots packed in 1 cwt. bags supplied free by the sellers.

Latest Oil Prices

LONDON, April 11.—LINSEED OIL was quiet. Spot, small quantities, £17 10s.; April, £14 10s.; May-Aug., £15 7s. 6d.; Sept.-Dec., £16 2s. 6d., naked. RAPE OIL was quiet. Crude, extracted, £29; technical refined, £30 10s., naked, ex wharf. COTTON OIL was steady. Egyptian, crude, £19; refined common edible, £21 10s.; deodorised, £23 10s., naked, ex mill. TURPENTINE was firm and dearer. American, spot, 61s 6d. per cwt.

HULL.—LINSEED OIL, spot, £15 12s. 6d.; April, £15 2s. 6d.; May-Aug., £15 15s.; Sept.-Dec., £16 10s. per ton. COTTON OIL.—Egyptian crude, spot, £18; edible refined, spot, £20 10s.; technical, spot, £20 10s.; deodorised, £22 10s. per ton, naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £17 10s. per ton, naked. GROUNDNUT OIL.—Crushed/extracted, spot, £22 10s.; deodorised, £26 10s. per ton. RAPE OIL.—Crushed/extracted, spot, £28; refined, £29 10s. per ton. SOYA OIL.—Crushed/extracted, spot, £19; deodorised, £22 per ton. COD OIL.—April 18s. per cwt. CASTOR OIL.—Pharmaceutical, spot, 38s.; first, 33s.; second, 30s. per cwt. TURPENTINE.—American, on the spot, 63s. per cwt.

Inventions in the Chemical Industry

Specifications Accepted and Applications for Patents

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Purifying Caustic Soda Waste

THE waste liquor formed when producing cellulose by digesting a cellulosic raw material with caustic soda lye, with or without sodium sulphide, sulphate or sulphite, can be freed from silica by adding to the digester liquor, before or during digestion, one or more oxides or hydroxides of metals having insoluble silicates such as those of aluminium, calcium, zinc or magnesium. The silica is precipitated as a silicate on the cellulose fibres and the waste liquor is separated free from silica. Alternatively, aluminium hydroxide may be added in the form of a solution in caustic soda or as bauxite. (See Specification No. 381,697 of E. L. Rinnan.)

Purifying Benzol

IN purifying a crude benzol containing solvent naphtha and benzols of lower boiling point with sulphuric acid, acid of 80-93 per cent. concentration can be used at temperatures between 10 and 45° C. with the object of avoiding oxidation and sulphonation. The crude benzol may be given an increased content of resin-forming substances by adding solvent naphtha, heavy benzol, or tar oils, or by incomplete dephlegmation in distilling the benzol from the saturated washing oil. Resinous materials are obtained as a residue on distilling the purified benzol, and may also be separated from the acid drawn off, the resinous materials yielding motor fuel, oil and resin when subjected, together or separately, to cracking distillation. The resin obtained by joint distillation is soluble in benzol and may be used as a substitute for coumarone resin. (See Specification No. 380,495 of Concordia Bergbau Akt.-Ges., R. Schneider and L. Nettlebusch.)

Manufacture of Dispersions

PRODUCTS which are stated to be dispersing agents can be prepared by condensing an aldehyde with a sulphonated product prepared from a mixture of a phenol with a fatty material, such as glycerides or other esters of higher fatty acids, the fatty acids themselves, the corresponding alcohols, or waxes. The products may be used alone or mixed with wetting agents, solvents, soaps and protective colloids. In examples (1) formaldehyde is condensed with a sulphonated mixture of wool fat and phenol, and the product neutralised with caustic soda; (2) acetaldehyde is condensed with a sulphonated mixture of castor oil and *m*- and *p*-cresol; (3) a paste of 1-amino-2-methylanthraquinone is dispersed by means of the product of example 1; (4) Marseilles soap is added to hard water containing the product of example 2 without being precipitated. (See Specification No. 380,252 of Compagnie Nationale de Matières Colorantes et Manufactures de Produits Chimiques du Nord Reunies Etablissements Kuhlmann.)

Lubricants for Fibres

LUBRICANTS for fibres may comprise di- or poly-hydric alcohol esters in which only part of the alcoholic hydroxy groups is esterified by higher fatty acids. The esters of di- or poly-hydric alcohols containing amino groups are excluded. Specified esters are glycerol mono-oleate, glycerol dioleate, ethyleneglycol mono-oleate, di-ethyleneglycol mono-oleate, and the corresponding esters of other saturated or unsaturated fatty acids containing more than five carbon atoms, e.g., of stearic, palmitic or ricinoleic acid. The esters may be used in conjunction with other lubricants (softeners, etc., such as glycol, diethyleneglycol, glycerol, fatty acids, soaps, e.g., potassium, sodium or triethanolamine soaps, or fats or oils, e.g., olive oil, castor oil, coco nut oil, neatsfoot oil, and, in general, the triglycerides of oleic, palmitic, stearic or other fatty acids; the addition of lecithin to the compositions containing oils is advantageous. (See Specification No. 380,042 of British Celanese, Ltd.)

Manufacture of Primary Alcohols

PRIMARY alcohols can be prepared by heating calcium formate in a solvent with the calcium salts of fatty acids and simultaneously reducing the aldehydes formed by means of hydrogen at elevated pressures in the presence of hydrogenating catalysts. Solvents specified include tetraline, dodecane, butyl alcohol, and the alcohol which comprises the reaction product in any particular case. Copper, nickel, cobalt, and chromium compounds, with or without previous reduction, are mentioned as catalysts. According to the example, calcium formate and calcium octoate are dissolved in lauryl alcohol, copper carbonate precipitated on kieselguhr added, and the mixture then heated in an autoclave whilst hydrogen is forced in; the resulting octyl alcohol is separated by distillation from the lauryl alcohol employed as solvent. In a similar manner, lauryl alcohol can be obtained from calcium laurate and stearic alcohol from calcium stearate. (See Specification No. 381,476 of H. T. Böhm Akt.-Ges.)

Anhydrous Citric Acid

ANHYDROUS citric acid can be produced by effecting oversaturation in a saturated aqueous solution of citric acid at a temperature between 41° and 100° C. Oversaturation may be effected by adding solid, hydrated citric acid to a solution saturated and maintained at, for example, 55° C., or by continued evaporation at the boiling point under an absolute pressure of more than 1½ inches of mercury, or by concentrating under similar conditions to about 42° Bé. and then heating under atmospheric pressure to 75° or 80° Co., after which the solution is allowed to cool in a crystallising pan to a temperature not below 41° C. (See Specification No. 380,813 of C. Prizer and Co.)

Specifications Accepted with Dates of Application

MANUFACTURE AND PRODUCTION OF VAT DYE-STUFFS OF THE ANTHRAQUINONE SERIES.—J. Y. Johnson (I. G. Farbenindustrie). Feb. 5, 1932. 389,961.

SENSITISING SILVER HALIDE EMULSIONS.—I. G. Farbenindustrie. Feb. 19, 1931. 389,969.

MANUFACTURE OF RESINOUS CONDENSATION PRODUCTS FROM AROMATIC AMINES AND FORMALDEHYDE.—Soc. of Chemical Industry in Basle. April 23, 1931. 390,000.

MANUFACTURE OF SULPHURIC ACID ESTERS OF ALIPHATIC ALCOHOLS. Soc. of Chemical Industry in Basle. May 29, 1931. 390,023.

MANUFACTURE OF RUBBER CHLORINATION PRODUCTS.—New York Hamburger Gummiwaaren Compagnie. June 5, 1931. 390,025.

MANUFACTURE OF 4-AMINO-2 : 5-DIALKOXY-DIPHENYL AND AZO-DYE-STUFFS THEREFROM.—I. G. Farbenindustrie. June 24, 1931. 390,029.

VULCANISATION OF RUBBER.—Naugetuck Chemical Co. Aug. 20, 1931. 390,045.

CONCENTRATION OF NITRIC ACID.—Appareils et Evaporateurs Kestner. Sept. 18, 1931. 390,066.

MANUFACTURE OF ALUMINIUM IN ELECTROLYSIS CELLS OF HIGH POWER.—Compagnie de Produits Chimiques et Electrometallurgiques Alais, Froges, et Camargue. Oct. 21, 1931. 390,076.

MANUFACTURE OF WATER-INSOLUBLE AZO-DYE-STUFFS.—I. G. Farbenindustrie. Oct. 5, 1931. 390,079.

PROCESS FOR THE MANUFACTURE OF ESTERS OF THE LEUCO COMPOUNDS OF VAT DYE-STUFFS.—I. G. Farbenindustrie. Oct. 7, 1931. 390,081.

PREPARATION OF CALCINED TRI-ALKALI PHOSPHATES.—Chemische Fabrik Budenheim A.-G. Oct. 21, 1931. 390,089.

MANUFACTURE OF RUBBER CHLORINATION PRODUCTS.—I. G. Farbenindustrie. Oct. 27, 1931. 390,097.

VACUUM PANS FOR BOILING CONCENTRATED SUGAR JUICES AND SYRUPS.—Naamlouze Vennootschap Machinefabriek Geb. Stork and Co. Jan. 15, 1932. 390,106.

PRODUCTION OF CORROSION RESISTING COATINGS ON ALUMINIUM OR ALUMINIUM ALLOYS.—Siemens-Electro-Osmose. Dec. 10, 1931. 390,110.

MANUFACTURE OF NITRILES OF RESIN ACIDS.—I. G. Farbenindustrie. Feb. 2, 1932. 390,120.

MALLEABLE AND AGE-HARDENABLE ALUMINIUM ALLOYS.—Dürenner Metallwerke A.-G., and K. L. Meissner. Sept. 12, 1931. 390,121.

Applications for Patents

DYE-STUFF INTERMEDIATES.—Imperial Chemical Industries, Ltd., and W. A. Sexton. March 27. 9220.

MANUFACTURE OF ALCOHOL FROM WAXES.—Imperial Chemical Industries, Ltd., and J. C. Smith. March 27. 9221.

DYE-STUFF INTERMEDIATES.—Imperial Chemical Industries, Ltd. March 29. 9517.

COLOURING MATTERS.—Imperial Chemical Industries, Ltd., and H. Raistrick. March 30. 9552.

COMPOSITION CONTAINING CHLORINATED RUBBER.—Imperial Chemical Industries, Ltd. March 31. 9781.

FILLING FABRICS.—J. Y. Johnson (I. G. Farbenindustrie). March 30. 9603.

MANUFACTURE OF DIACETYLENE DERIVATIVES.—J. Y. Johnson (I. G. Farbenindustrie). March 30. 9604.

APPARATUS FOR CARRYING OUT EXOTHERMIC REACTIONS.—J. Y. Johnson (I. G. Farbenindustrie). March 30. 9605.

DYEING ANIMAL FIBRES.—J. Y. Johnson (I. G. Farbenindustrie). March 30. 9606.

DYEING TEXTILE, ETC., MATERIALS.—J. Y. Johnson (I. G. Farbenindustrie). March 31. 9754.

MANUFACTURE OF CONDENSATION PRODUCTS.—J. Y. Johnson (I. G. Farbenindustrie). March 31. 9755.

From Week to Week

MR. WALTER L. CHANCE, chairman of Chance Bros. and Co., Ltd., has been appointed president of the Birmingham Chamber of Commerce.

MR. CHARLES JAMES ELLIS, of Milngavie, Dumbartonshire, retired technical chemist, son of the late Clement Ellis, of Glasgow, left estate to the value of £8,656.

A PROPOSAL to set up a Gas and Oil Development Committee is being considered by the Scottish National Development Council. The idea is to stimulate the production of Scottish oils.

THE DEATH TOOK PLACE last week, in a Paisley nursing home, of Mr. A. F. C. Waters, West March House, Paisley, of William Waters and Co., chemical manufacturers, Clippens.

PROFESSOR H. E. ARMSTRONG will deliver the Huxley Memorial Lecture at the Imperial College of Science and Technology, South Kensington, on May 4, at 5.30 p.m. His subject will be "Our Need to Honour Huxley's Will."

MISS C. McPHERSON, formerly forewoman at the Regent Factory, Linlithgow, has been presented with a gold watch and diamond pin by Imperial Chemical Industries, Ltd., on her completion of 25 years' service. She is now with an associate company in Canada.

MR. PATRICK KEILL, manager and director of Stevenson Brothers (Dundee), Ltd., dyers and cleaners, Dundee, has been appointed manager and director of J. Pullar and Sons, Ltd., Perth. Mr. H. L. Hopkinson has been appointed manager at Stevensons' Hilltown Works.

MR. FRANCIS PRICE BAYLEY, of F. S. Bayley, Clapham and Co., Manchester, died, after a long illness, at his home on March 27. The executors have transferred the business to Mr. S. J. C. Mason, London, who, with the co-operation of Mr. J. F. A. Segner, Manchester, will carry it on as hitherto with the present staff. A private limited company is being formed, in which Mr. F. P. Bayley's family will have an interest.

THE CHEMICAL PRACTITIONER was the subject of a lecture delivered to the members of Olan Scientific and Literary Association by Mr. G. H. Stott, M.Sc., F.I.C., who is on the staff of the British Aluminium Company, Kinlochleven. Mr. Stott dealt with the methods adopted in analysing foods and beverages, and in tracing contamination. He also demonstrated some of the methods used in detecting the presence of metallic and other poisons.

THE CHILEAN CABINET on April 1 took notice of the observations recently submitted by the representatives of the United States, Great Britain, Germany and Holland on the subject of the re-establishment of nitrate exportation rights. It is stated unofficially that the Cabinet decided unanimously that the matter should be decided by the Law Courts, and not by diplomatic intervention.

A FUND IS BEING RAISED for the endowment of the Commercial Road Talmud Torah, as a tribute to the late Lord Melchett. Mr. R. D. Blumenfeld is chairman of the council which is organising the scheme, and the Lord Mayor of London and several other friends are interested. The Prince of Wales has sent a message expressing his pleasure that such a tribute should be arranged, as Lord Melchett was keenly interested in the institution.

THE SPRING TOUR of the Ceramic Society will commence on May 4, when members will visit Stourport in the morning and Stourbridge in the evening. On May 5, members will have a choice of visiting either Manchester and Darwen or St. Helens and Accrington. A banquet will be held on the same evening at St. Annes (tickets 12s. 6d.). On May 6, a joint meeting will be held at 10.0 a.m., when papers will be read on (1) "The Permeability to Air and to Water of Heavy Clay Products," by Mr. F. H. Clews and Mr. A. T. Green, (2) "The Winning and Transport of Raw Materials used in the Clay Industries," and (3) "The Constitution of Coal."

FR. JULIUS A. NIEWLAND, professor of science at the University of Notre Dame, Indiana, U.S.A., and the discoverer of a method to produce synthetic rubber, has been elected to a fellowship of the Chemical Society (London). Fr. Nieuwland, who was ordained thirty years ago, is the editor and founder of the "American Midland Naturalist," a Fellow of the Indiana Academy of Science and a member of the American Chemical Society, the Deutsches Chemischen Gesellschaft, and the Chemical Society of London. He is well known for his acetylene research in organic chemistry, having formulated the Lewisite gas principle in his Ph.D. thesis at the Catholic University of America in 1904. Last November he announced a new paint or lacquer, S.D.O. (synthetic drying oil), which becomes hardened shortly after being applied to a surface and is henceforth insoluble in all solvents, and is not corroded, removed, or broken by corrosives as drastic, even, as acids. It makes wood, concrete, and other porous materials completely waterproof. Completely dry S.D.O. surfaces will withstand a temperature as high as 210° C.

THE EMPLOYEES of Imperial Chemical Industries, Ltd., at Nobel's Ardeer Factory have contributed £172 to charities during the past three months.

MR. WILLIAM HARRISON MARTINDALE, Ph.D., F.C.S., died at his residence, 22 Chatsworth Road, Brondesbury, London, on April 8.

A NEW CHEMICAL PLANT is to be established at Picton, Ontario, Canada, to be known as the Picton Chemical Works, and machinery is to be installed before July.

DAMAGE TO THE EXTENT of £15,000 was caused by a fire which completely wrecked the warehouse at the works of A. Spafford and Co., Ltd., Colver Road, Sheffield, on April 2. Only the four walls of the three-storey building were left standing.

THE MINISTER OF HEALTH has appointed Mr. J. S. Carter, M.Sc., Ph.D., F.I.C., to be an inspector under the Alkali, etc., Works Regulations Act, 1906. He has been assigned to the district with headquarters in London.

AN APPEAL by Mr. W. M. Kneale, of New Oxford Street, London, against an award of £20,000 damages to Lever Brothers, Ltd., in a libel action against Mr. Kneale and Mr. G. H. Bagnall was dismissed with costs on April 5 by the Court of Appeal.

A NEW SOAP MANUFACTURING INDUSTRY is projected for the Ville La Salle district of Montreal. The town council has approved 50 per cent. reduction of annual property taxes for a period of ten years on a three-storey factory to be erected by J. B. Williams Co. (Canada), Ltd., manufacturers of shaving creams and soaps.

AT THE ANNUAL GENERAL MEETING of the Manchester section of the Oil and Colour Chemists' Association, presided over by Mr. A. Hancock, the report submitted by the hon. secretary (Mr. H. Clayton) showed that there were now about 100 members of the section. Mr. Clayton was re-elected hon. secretary and Mr. F. Sowerbutts hon. treasurer for the ensuing year.

SIR HARRY MCGOWAN presented long service awards to members of the Head Office staff of Imperial Chemical Industries, Ltd., on March 20. The awards, which were in respect of service up to December 31, 1932, were two gold medals (for 40 years' service), seven gold medals (for 35 years' service), and four silver watches and medals (for 25 years' service).

THE QUESTION OF THE DENUNCIATION of the agreement between the producers of natural and synthetic nitrates, which automatically lapses on June 30 unless renewed before April 15, is being considered by the Chilean Government, and it is believed that the agreement will be denounced. It is expected that the Cosach Liquidation Commission will denounce the agreement relating to synthetic nitrates in consequence of the small quota reserved in it for Chilean nitrates.

A GOLD WATCH and gold and platinum guard has been presented to Mr. Weldon Hanson, of Norton, who is retiring from service with Dorman Long and Co., Ltd., Middlesbrough, after 51 years' service in the iron and steel trade. Mr. Hanson, who is head of the research department of the firm, started work as a chemist. Before joining Dorman Long, Mr. Hanson was with Bell Brothers in their laboratory at the Clarence Ironworks. He assisted in the first experiments made in the extraction of brine and the manufacture of salt on the north bank of the Tees.

SPEAKING ON THE USE OF RUBBER in modern buildings at a luncheon held by the Rubber Growers' Association, Mr. R. D. Porritt, M.Sc., F.I.C., director of the British Association of Rubber Manufacturers, said that the properties of rubber were capable of such profound modifications that the material is no longer recognisable in all its manifestations except by the expert. The speaker discussed the value of rubber for flooring, in protecting steel in damp and acid-laden atmospheres, and attractiveness of rubber upholstery; he also mentioned the application of rubber in wall paints and distemper.

THE COUNCIL of the London Chamber of Commerce has written to Mr. Walter Runciman, President of the Board of Trade, drawing attention to the serious financial difficulties in which the Research Association of British Rubber Manufacturers has been placed by a combination of circumstances already known to the department. Unless measures can be devised before June to ensure for the association a definite income, the valuable work at present carried on at Croydon, the Council understands, must terminate, and the organisation, which the Department of Scientific and Industrial Research helped to establish in 1920, must be disbanded. The Council says that the value of the association's work is recognised on all sides, and not only the rubber industry but also British industry generally must suffer if the organisation is allowed to disperse. Accordingly, the Council urges the Government to facilitate the passage of the Rubber Industry Bill through Parliament or to support any alternative method available to ensure the continuance of co-operative research.

MR. ALFRED HAROLD WIGGIN, of Bordesley Hall, Alvechurch, for many years managing director of Messrs. Henry Wiggin and Co., nickel manufacturers, of Birmingham, formerly a director of Muntz's Metal Co., Ltd., and Elliott's Metal Co., Ltd., Birmingham, who died on January 29, left gross estate of the value of £91,935, with net personalty £76,618.

SADLER AND CO., LTD., of Middlesbrough, chemical manufacturers, announces that it has acquired a by-product plant attached to the Randolph Colliery, Evenwood, near Bishop Auckland. The company will there distil tar for reduction into benzol at the Middlesbrough works. The plant, installed by the original owners, Pease and Partners, Ltd., is among the finest in the country. The development will mean employment for hundreds of men in the Evenwood area.

AFTER THE FIRST ANNUAL MEETING of the Federation of Unions in the bleaching, dyeing, and finishing industry at Bradford, on April 8, it was stated that a report was considered of the negotiations with the Allied Associations, the employers' organisation, on the unions' application to restrict the working week to 48 hours, the unions being prepared to adopt a shift system where necessary. The report stated that the employers were not prepared to agree to a rigid 48-hour week, but if flexibility were allowed they would try to keep within that margin. The annual meeting instructed the executive to proceed with the negotiations and to urge the abolition of over-time with the object of absorbing unemployed.

AN INSTRUCTIVE LECTURE on "Research" was delivered by Major F. A. Freeth, joint research manager of Imperial Chemical Industries, Ltd., to an audience consisting of members of the Associated Electrical Industries, Ltd., in London recently. Major Freeth stated that the organisation of research had not yet received proper attention, but the situation was becoming more hopeful. In the younger generation's enthusiasm and idealism must be sought the necessary driving force. He emphasised the value of personal contact and the grant of facilities to research workers for exploring every phase of scientific activity. To encourage the younger members as represented by the apprentices, Major Freeth made the generous gift of his complete set of Kelvin's works to their reference library.

SIR PERCY GREENAWAY, Lord Mayor of London, visited the John Benn Hostel at Stepney on April 10. After witnessing a swimming display by some of the boys, he was entertained at supper. In welcoming the Lord Mayor, Sir Ernest Benn, president of the East End Hostels Association, said that the function of the hostel was to provide all the advantages of family life offered by the average home, and to instil into the boys a feeling of pride. To this end the boys contributed varying sums for their keep and so removed any feeling of charity. The hostel might, in fact, be regarded as a research station where experience was gained in the provision of adequate home accommodation for the London boy. Later the Lord Mayor and other guests were conducted by some of the 81 resident boys around the departments of the building.

Company News

I. G. Farbenindustrie.—A dividend of 7 per cent. is announced for the past year.

Hadfields, Ltd.—The directors state that they are unable to recommend a dividend on the ordinary shares for 1932. The last payment was 2½ per cent. for the year 1929.

Unilever, Ltd.—The directors propose to maintain at the same rate as the interim the final distribution on the ordinary shares at 36 Dutch cents, per share, payable on May 16.

Burt, Boulton and Haywood, Ltd.—No interim dividend is to be paid on the ordinary shares of the company. Last year 4 per cent. was paid, with a final at the same rate.

Unilever N.V.—The directors have decided to recommend to the annual general meeting, to be held on April 28, a final dividend on the ordinary shares of Fl.30 per Fl.1,000 share, payable on May 16.

Eastman Kodak Co.—The net profits for the year 1932 were \$6,058,749. In the previous year, profits were \$13,408,785. Common dividends totalling \$4.00 per share, against \$8.00, have been paid.

United Molasses Co., Ltd.—The total profits in 1932, after charging management expenses and foreign taxation, but before providing for depreciation, stock reduction, and the cost of molasses run to waste, amounted to £375,259. After charging depreciation on motor vessels and other equipment amounting to £356,531, trading profit was £18,728, against £61,232 in 1931. Deducting consideration for cancellation of molasses purchase contract £29,352 cost of molasses run to waste £90,553, and depreciation in value of stocks £765,089—a total of £884,994—less £39,222 over-reserved in 1931 for drawback claims in foreign subsidiaries, and the trading profit of £18,728, there is a deficit on revenue account of £827,044. To this is added capital losses of £299,565, and the debit brought forward of £775,673, making a total debit at the end of 1932 of £1,902,282.

New Companies Registered

Aug. & Geo. Fischer, Ltd., 22-3 Great Tower Street, London, E.C.3. Registered March 28. Nominal capital £5,000 in £1 shares. Dealers in drugs, gums, spices, essential oils and other essences, oils, oleaginous and saponaceous substances and other raw materials used in the manufacture of scents, soaps and unguents and produce of all kinds, etc. Directors: E. A. E. Marno, and James Attenborough.

Bristol Bulk Oil Storage, Ltd., 18 Passage Street, St. Philips Bridge, Bristol. Registered April 6. Nominal capital £1,000 in £1 shares. Objects: To acquire the business of oil storers and merchants carried on by Geo. F. Herniman and Walter Herniman at 18 Passage Street, St. Philips Bridge, Bristol, and elsewhere, and to carry on the business of buyers, sellers and dealers, manufacturers, refiners and storers of all kinds of oil (including petroleum and its derivatives) and oleaginous and saponaceous substances, etc. Directors: G. F. Herniman, and Walter Herniman.

Lavvo Co. (Manchester), Ltd., 17 George Street, West Gorton, Manchester. Registered March 30. Capital £3,500 in £1 shares. Manufacturers and shippers, importers and exporters of agents for and dealers in disinfectants of all kinds, soaps, paints, stains, varnishes, lacquers and polishes, etc. Directors: Stephen Kendrick, and Francis Kendrick.

Monat Laboratories, Ltd. Registered April 1. Nominal capital £2,000 in £1 shares. Manufacturing chemists, manufacturers of and dealers in chemicals of all kinds, etc. Directors: W. J. C. Monat, M.P.S., No. 3, Bungalow, Bray Road, Maidenhead, J. S. Stewart, and J. Thomson.

Pharmaceutical Products, Ltd., 61 Welbeck Street, London, W.1. Registered on April 5. Nominal capital £1,000 in £1 shares. Chemical manufacturers and dealers, chemists, druggists, dyers, etc. Directors: E. T. Neathercoat, E. A. Umney, and E. J. C. Savory.

Scolife, Ltd. Registered April 3. Nominal capital £5,000 in £1 shares. Objects: To acquire the business of Harry Scholey, carried on at 91 Victoria Street, S.W.1, and to carry on the business of manufacturers of and dealers in synthetic resin products and urea powders of all kinds, varnishes, enamels, polishes, lacquers, etc. Directors: R. S. Grist, 169 Abercrombie Road, Streatham Vale, London, S.W.16, and Miss E. G. Culverhouse.

Stratford-on-Avon Brewing Products, Ltd. Registered April 4. Nominal capital of £100 in £1 shares. Manufacturing, consulting and analytical chemists, consulting brewers chemists to the brewing and mineral water trades, sugar boilers, manufacturers of preservatives, antiseptics, disinfectants, colouring matter, varnish, chemical extracts, essences and combinations, finings, invert and other sugars, carried on by F. Kendall and Son, Ltd., and all or part of the assets and liabilities. A subscriber is Richard A. Piment, 6 Bennetts Hill, Birmingham. Directors: Reginald Y. T. Kendall, and J. N. Kendall.

Forthcoming Events

Apr. 17.—Electroplaters' and Depositors' Technical Society. "Electrodeposition of Palladium." 8.15 p.m. Northampton Polytechnic Institute, St. John Street, London.

Apr. 18.—Hull Chemical and Engineering Society. General meeting. 7.45 p.m. Grey Street, Park Street, Hull.

Apr. 21.—Institute of Fuel (East Midlands Section). Annual general meeting. "The Rational Examination of Coal." Dr. Wilfrid Francis. 7 p.m. University College, Nottingham.

Apr. 26.—Institute of Fuel (London Section). Annual general meeting. "Economic Regenerators for Open Hearth Furnaces." Dr. Ing. H. Trinius: "Calculations for Open Hearth Regenerators." Herbert Southern. 6 p.m. Burlington House, Piccadilly, London.

Apr. 26.—Society of Chemical Industry (Plastics Group). Annual general meeting. London.

Books Received

The Chemical Manufacturers' Directory of England, Wales and Scotland, for 1933. London: Simpkin Marshall, Ltd. Pp. 202. 4s. 6d.

Economic Conditions in Brazil, December, 1932. Report by E. Murray Harvey and J. G. Lowax. London: H.M. Stationery Office. Pp. 100. 3s.

Manufacture of Nitro Cellulose Lacquers. (The Modern Chemical Industries Series). By R. G. Daniels. London: Leonard Hill, Ltd. Pp. 121. 10s.

Evaporating, Condensing and Cooling Apparatus. By E. Hausbrand. Translated from the German by A. C. Wright. Revised and enlarged by Basil Heastie. London: Ernest Benn, Ltd. Pp. 504. 25s.

Trade News

Industrial Glassware

In their new catalogue on industrial glassware, Butterworth Bros., Ltd., give illustrations of a wide range of goods. Machinery glass forms an important feature of the firm's activities, lubricators of solid construction, combining good appearance with strength and economy, and suitable for conditions of excessive vibration and where grease lubrication is desirable, being manufactured in great quantities. Crank and marine lubricators, made in glass and mounted in best gunmetal, are made perfectly air tight, and are adapted to motions where needle lubricators cannot be employed. These lubricators can be refilled with oil without removing them from the bearing. The firm has recently enlarged its blow lamp department.

Corrosion Resisting Rubber Products

DEXONITE, which is a compound of vulcanised hard rubber with other ingredients, has now been on the market for some 30 years, and its various uses in the engineering, electrical and chemical industries have given it a prominent position for possessing indisputable higher properties than articles made of ordinary ebonite. Its principal features are that it is acid and alkali resisting, non-brittle and will resist high temperatures. It is produced in the form of sheet, rod, tubes, ball valves, handles, pipes, fittings, cocks, etc. It is also extensively used as a covering for acid storage tanks, saturators, filters, pumps and all castings operating in corrosive liquors or fumes. DEXINE compound, another product supplied by DEXINE, Ltd., is a composition of vulcanised india-rubber. It is of an exceedingly tough and frictionless nature, capable of withstanding extreme temperature, and impervious to the deleterious action of acids, gases, ammonia, oils and greases.

A Primer for Painting Concrete Surfaces

THE Nor-Rust Liquid Lead Co., Ltd., are addressing a special circular to architects and engineers, outlining the application of "Nust" to portland cement mortar. In tests carried out at the Building Research Station, specimens of portland cement-sand mortar (1 : 3 by weight) were painted at 8 days age with one coat of special grade "Nust," followed by a coat of prussian blue white lead undercoating, and they were then kept wet for 11 days. Under such conditions three coats of ordinary white lead linseed oil paint are completely destroyed in about 6 days, but the special grade "Nust" was very little affected and the paint over it became slightly bleached at the edges only. The conclusion reached was that "Nust" S. D. is very suitable for use as an alkali-resistant primer for ordinary paint on portland cement and other alkaline surfaces.

Resistant Linings and Floorings for Plant

RESISTANT linings for chemical plant, incorporating unsurpassed materials, methods and designs, are manufactured by H. Windsor and Co., Ltd. This firm has now laid over one million square feet of flooring on their "Ka Be" principle, which is claimed to solve all corrosion problems. For instance, this flooring, with acid resisting tiles set in "Ka Be" jointing compound, has been adopted successfully in an artificial silk spinning shed, and at copper recovery plants. The firm also manufactures the "Zeta" patent self-reinforcing construction which has been adopted for nitric acid storing tanks of capacities up to 10,000 gallons. This lining is not only acid-proof, but is also alkali and oil proof. The "Zeta" method of construction enables tanks, towers, flues and chimneys to be constructed entirely of materials which withstand corrosion both inside and outside.

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